

Daily report

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## Analysis and prediction of COVID-19 for EU-EFTA-UK and other countries

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Situation report 145

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*With the financial support of*



*and*



## Foreword

The present report aims to provide a comprehensive picture of the **pandemic situation of COVID-19** in the EU countries, and to be able to foresee the situation in the next coming days. We provide some figures and tables with several **indexes and indicators** as well as an **Analysis** section that discusses a specific topic related with the pandemic.

As for the predictions, we employ an **empirical model**, verified with the evolution of the number of confirmed cases in previous countries where the epidemic is close to conclude, including all provinces of China. The model does not pretend to interpret the causes of the evolution of the cases but to permit the **evaluation of the quality of control measures made in each state** and a **short-term prediction of trends**. Note, however, that the effects of the measures' control that start on a given day are not observed until approximately 7-14 days later.

We show an individual report with 8 graphs and a summary table with the main indicators for different countries and regions. We are adjusting the model to **countries and regions** with at least 4 days with more than 100 confirmed cases and a current load over 200 cases.

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## Situation and highlights

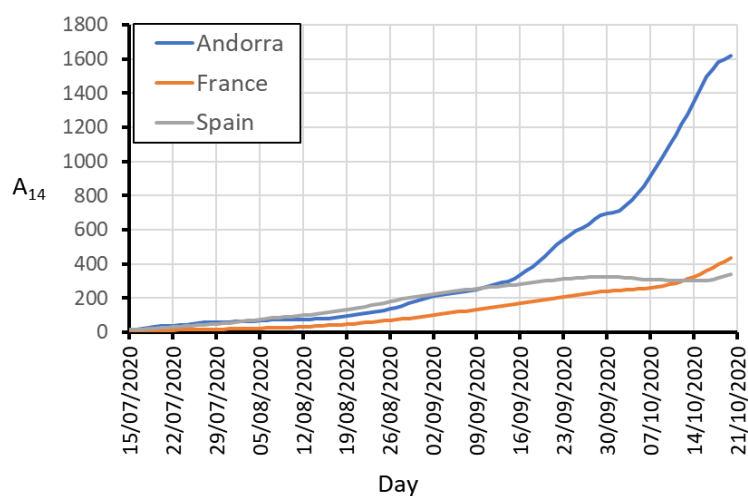
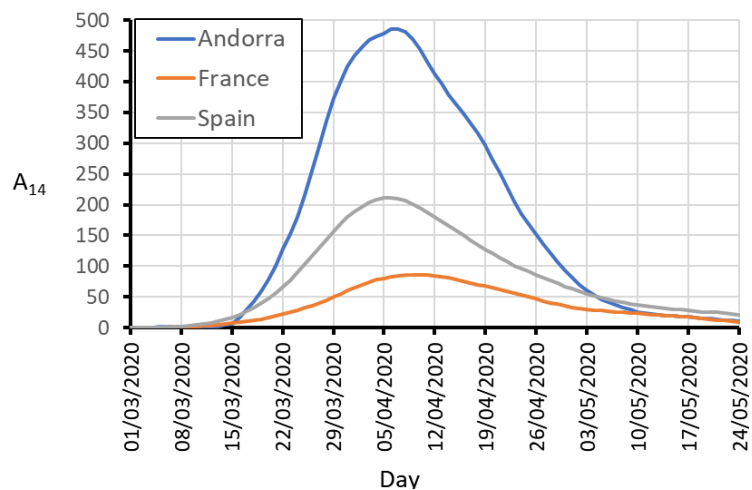
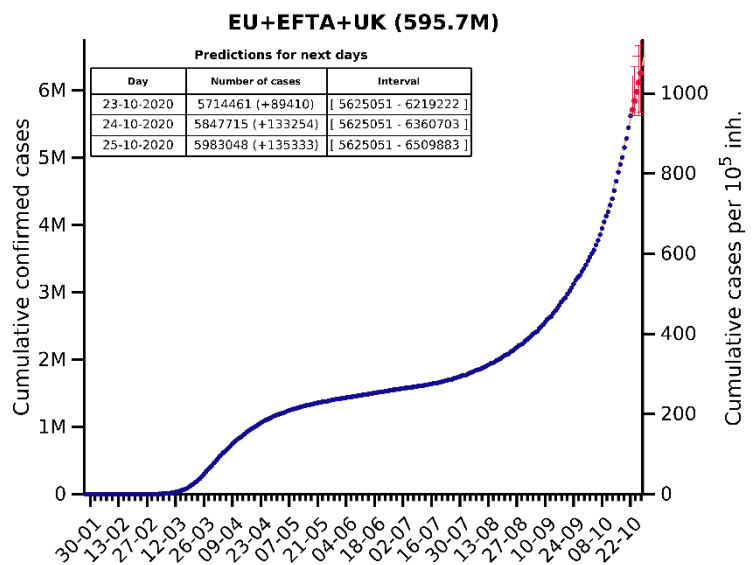
### Global situation

Today we focus our attention on a small country, Andorra. With a population of 77,543 inhabitants, it has a per capita income of \$40,886, a value higher than its neighbors France \$40,494 and Spain \$29,614. A country with a high quality health care system which, in some rankings, appears among the top 5 in the world. Its health expenditure per capita is \$4,041, slightly lower than that of France \$4,380, but much higher than that of Spain \$2506.

During the months of March and April they properly controlled the pandemic, despite reaching  $A_{14}$  values higher than in France and Spain. They finally managed to have even a few days with zero new cases. Despite this, in mid-July the epidemics came back and started a systemic growth. Right now, and from mid-September, new cases clearly exceed that of their two neighbors France and Spain on a per capita basis. It is currently the country with the largest  $A_{14}$  in the world, and at the same time, probably one of the countries with the highest number of tests per capita.

Andorra is a country of services (hiking, ski slopes, trade), its economy depends largely on the visits of its neighbors from France and Spain. An important part of the tourist visits are a day or a few days, visits for shopping, for excursions, to enjoy the ski slopes.

If we consider the influence of tourism on the epidemiological situation, it may initially seem that the incidence should be proportional to the weighted average of the country and the countries of the visitors. Looking at the behavior of Andorra, we may have to assess that the situation depends especially on the number of contacts that are made, not just on the incidence of the country of origin. In other words, if we have many visits we might have a lot of contacts with contagious people. This needs to be carefully evaluated. The possible conclusions are not only important for Andorra, but for all possible tourist destinations.

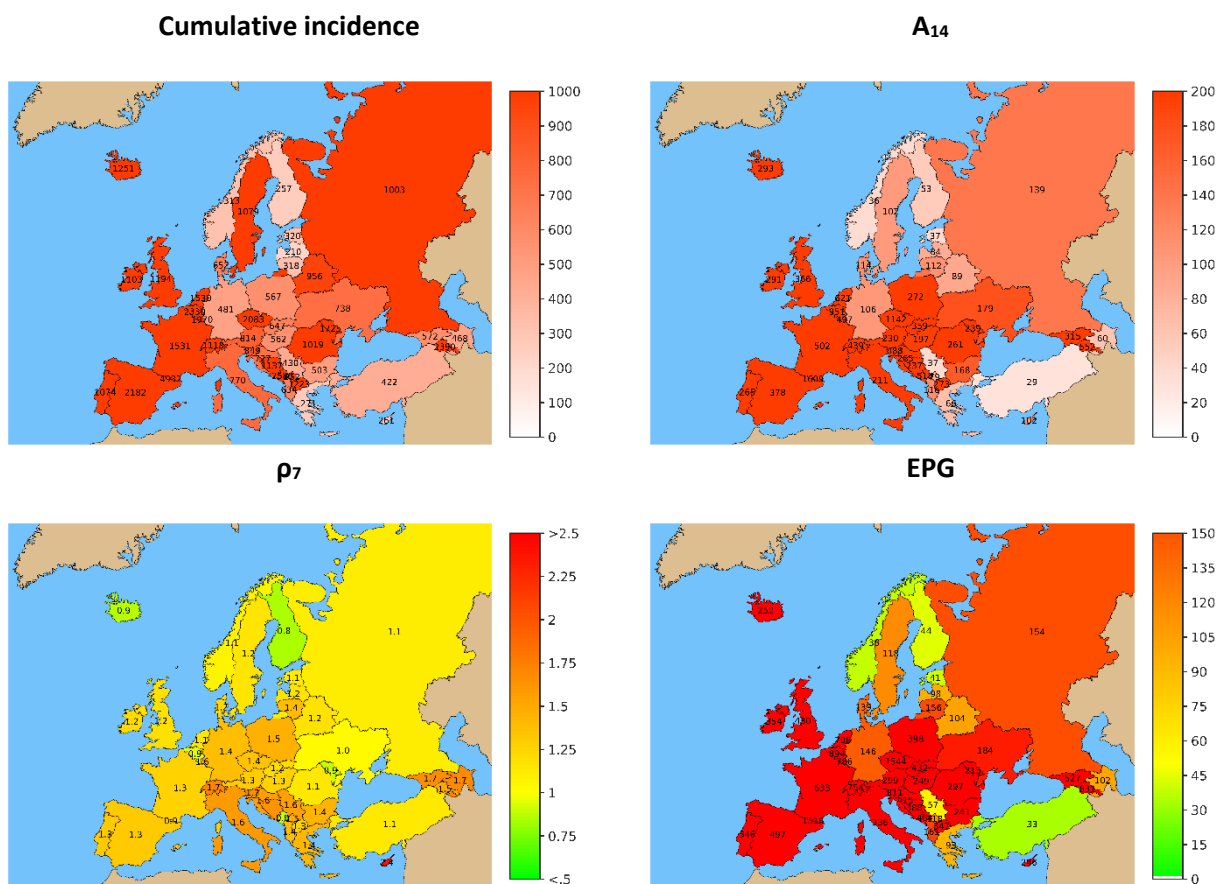


If the hypothesis of an above-average contact level for destinations mainly based on tourism were correct, Andorra would have to close its borders to reduce the incidence, and let epidemiological surveillance control the internal situation.

## Situation and trends per country

**Maps of current situation in EU countries.** Colour scale is indicated in each legend.

- Cumulative incidence: total number of reported cases per 100,000 inhabitants
- $A_{14}$ : Cumulative incidence last 14 days per 100,000 inhabitants (active cases)
- $\rho_7$ : Empiric reproduction number
- EPG: Effective Potential Growth ( $EPG = A_{14} \cdot \rho_7$ )



**Tables of current situation in EU countries.** Colour scale is indicated in each legend.

*Incidence, mortality and epidemiological indexes.*

Country	Reported data						Indexes		
	14-day attack rate /10 <sup>5</sup> inh.	Active cases (last 14 days)	Attack rate /10 <sup>5</sup> inh.	Cumulative cases	Mortality /10 <sup>5</sup> inh.	Cumulative deaths	$\rho_7^{(1)}$	EPG <sup>(2)</sup>	Biocom-Cov degree
Czech Republic	1,142.1	122,308	2,083.0	223,065	17.2	1,845	1.35	1,544	9
Belgium	951.3	110,253	2,330.0	270,038	91.4	10,588	0.94	894	9
Netherlands	621.4	106,479	1,529.7	262,109	40.3	6,909	1.14	708	9
France	501.6	327,405	1,530.5	999,043	52.4	34,210	1.26	633	9
Luxembourg	497.5	3,114	1,970.2	12,333	22.4	140	1.58	786	9
Slovenia	487.8	10,140	849.0	17,651	8.4	174	1.66	811	9
Switzerland	438.9	37,986	1,117.7	96,731	21.6	1,866	1.72	754	9
Liechtenstein	398.6	152	755.2	288	2.6	1	1.76	703	9
Spain	378.4	177,957	2,182.4	1,026,281	73.4	34,521	1.31	497	9
Malta	369.4	1,631	1,163.4	5,137	11.1	49	1.49	549	9
United Kingdom	366.3	248,652	1,193.9	810,467	65.3	44,347	1.17	430	9
Slovakia	359.1	19,604	647.1	35,330	2.1	115	1.20	432	9
Iceland	293.3	1,001	1,250.7	4,268	3.2	11	0.86	252	9
Ireland	291.4	14,390	1,103.2	54,476	37.9	1,871	1.21	354	9
Poland	272.4	103,087	567.3	214,686	10.6	4,019	1.46	398	9
Portugal	264.9	27,007	1,074.3	109,541	22.0	2,245	1.30	346	9
Croatia	264.6	10,861	727.1	29,850	9.9	406	1.57	415	9
Romania	261.5	50,304	1,018.9	196,004	32.0	6,163	1.13	297	9
Austria	230.2	20,736	814.3	73,339	10.6	957	1.30	299	9
Italy	210.6	127,328	770.3	465,726	61.1	36,968	1.60	336	9
Hungary	197.3	19,056	561.9	54,278	14.0	1,352	1.26	249	9
Bulgaria	168.0	11,671	502.7	34,930	15.3	1,064	1.43	241	9
Denmark	114.1	6,607	652.0	37,763	12.0	694	1.22	139	8
Lithuania	111.6	3,038	318.2	8,663	4.6	125	1.40	156	8
Germany	105.8	88,631	481.3	403,291	11.9	9,954	1.38	146	8
Sweden	102.5	10,347	1,079.0	108,969	58.7	5,930	1.15	118	7
Cyprus	102.4	1,236	261.2	3,154	2.1	25	2.40	246	8
Latvia	84.2	1,588	209.8	3,958	2.6	49	1.16	98	7
Greece	65.6	6,835	270.7	28,216	5.3	549	1.42	93	7
Finland	52.5	2,910	257.3	14,255	6.4	355	0.84	44	6
Estonia	36.7	487	320.2	4,247	5.4	71	1.12	41	5
Norway	36.0	1,952	312.9	16,964	5.1	279	1.07	38	5

Colour scale								
>150.0	Worst	Worst	Worst	Worst	Worst	>2.0	>150	
0.0	Best	Best	Best	Best	Best	0.0	0	

**Table of current situation in some EU provinces.** Colour scale is indicated in each legend.

Province	Reported data						Indexes		
	14-day attack rate /10 <sup>5</sup> inh.	Active cases (last 14 days)	Attack rate /10 <sup>5</sup> inh.	Cumulative cases	Mortality /10 <sup>5</sup> inh.	Cumulative deaths	$\rho_7^{(1)}$	EPG <sup>(2)</sup>	Biocom-Cov degree
Brussels	1,570.8	18,975	3,484.9	42,097	137.2	1,657	1.27	1,991	9
Prague	1,243.5	15,817	2,909.3	37,006	NA	0	NA	1,583	9
North Holland	741.5	21,156	1,899.5	54,194	33.3	951	1.17	868	9
Madrid	435.0	28,888	4,237.0	281,364	150.1	9,967	0.85	369	9
London	250.7	22,466	887.0	79,485	NA	NA	1.15	289	9
Lazio (Rome)	202.0	11,875	527.5	31,010	18.4	1,081	1.75	353	9
Berlin	195.5	7,369	649.5	24,481	6.5	245	1.29	252	9

Colour scale								
>150.0	Worst	Worst	Worst	Worst	Worst	>2.0	>150	
0.0	Best	Best	Best	Best	Best	0.0	0	

<sup>(1)</sup>  $\rho_7$  is the average of 7 consecutive  $\rho$ , but can still fluctuate. <sup>(2)</sup> EPG stands for Effective Growth Potential, which is the product of reported cumulative incidence of last 14 days per 10<sup>5</sup> inhabitants by  $\rho_7$  (empiric reproduction number). Biocom-Cov degree is an epidemiological situation scale based on the level of last week's mean daily new cases (<https://upcommons.upc.edu/handle/2117/189661>, <https://upcommons.upc.edu/handle/2117/189808>).

**Situation of hospitalisations and ICUs in some EU countries.** The analysis is done for those countries that report a historical series with current (active) number of patients in hospitals and ICUs<sup>1</sup>. We provide:

- Current active hospitalisations and patients in ICU per 100,000 inhabitants.
- Current absolute number of active hospitalisations and patients in ICU.
- Rate of occupation of curative care hospital beds by Covid-19 patients (data from Eurostat 2018<sup>2</sup>), only for hospitalisations.
- Current rate of occupation with regards to the maximum Covid-19 occupation reached in this pandemic.
- Weekly increase in Covid-19 patients in hospitals and ICUs.

Country	Hospitalisations					Intensive Care Units			
	Active /10 <sup>5</sup> inh.	Active (total)	Occupation (Eurostat 2018) (%)	Occupation (historical maximum) (%)	Week-to-week Growth (%)	Active /10 <sup>5</sup> inh.	Active (total)	Occupation (historical maximum) (%)	Week-to-week Growth (%)
Belgium	31.5	3649	6.4	63.4	69.6	4.9	573	44.6	57.9
France	23.0	15008	7.4	46.5	34.5	3.7	2441	34.5	28.4
Hungary	22.9	2209	5.3	100.0	28.3	2.1	200	99.5	19.1
Italy	19.2	11598	7.4	35.1	54.2	1.7	1049	25.8	58.0
Slovenia	19.0	394	4.6	100.0	53.5	3.2	67	100.0	56.0
Slovakia	15.2	828	3.2	94.5	60.9	0.3	15	68.2	20.4
Portugal	13.4	1365	4.0	100.0	26.9	2.0	200	87.7	27.2
Switzerland	12.8	1108	3.6	49.2	94.4	1.2	107	27.7	79.2
Austria	10.0	900	1.9	65.9	12.0	2.9	258	86.3	23.2

**Colour scale**  
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**Colour scale**  
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<sup>1</sup> <https://github.com/ec-jrc/COVID-19>

<sup>2</sup> [https://ec.europa.eu/eurostat/databrowser/view/hlth\\_rs\\_bds/default/table?lang=en](https://ec.europa.eu/eurostat/databrowser/view/hlth_rs_bds/default/table?lang=en)

## Situation and trends in some European regions<sup>3</sup>

Table of current situation in Spain regions. Colour scale is indicated in each legend.

Country	Reported data						Indexes		
	14-day attack rate /10 <sup>5</sup> inh.	Active cases (last 14 days)	Attack rate /10 <sup>5</sup> inh.	Cumulative cases	Mortality /10 <sup>5</sup> inh.	Cumulative deaths	$\rho_7^{(1)}$	EPG <sup>(2)</sup>	Biocom-Cov degree
Navarra	944.0	6,136	4,311.5	28,023	97.7	635	1.22	1,151	9
Melilla	722.4	612	2,174.4	1,842	10.6	9	1.02	740	9
Castilla y Leon	525.5	12,654	2,973.6	71,607	137.5	3,311	0.99	523	9
Aragon	496.3	6,555	3,366.7	44,467	112.5	1,486	1.13	560	9
La Rioja	491.7	1,542	3,313.0	10,389	138.4	434	1.24	611	9
Madrid	435.0	28,888	4,237.0	281,364	150.1	9,967	0.85	369	9
Ceuta	386.6	328	1,317.7	1,118	14.1	12	1.08	419	9
Castilla-La Mancha	386.5	7,868	2,876.5	58,552	157.3	3,201	0.96	372	9
Murcia	385.8	5,740	1,903.8	28,323	11.1	165	0.99	380	9
Catalunya	368.9	27,908	2,257.1	170,752	78.5	5,942	1.21	445	9
Euskadi	358.3	7,805	2,527.1	55,041	91.6	1,996	1.35	483	9
Andalucia	287.9	24,256	1,153.6	97,204	24.5	2,064	1.05	301	9
Extremadura	281.0	2,994	1,596.3	17,007	60.2	641	1.33	372	9
Asturias	247.9	2,534	826.2	8,446	35.5	363	1.23	305	9
Galicia	165.1	4,459	1,048.8	28,320	29.8	805	1.05	174	8
Cantabria	155.1	902	1,367.4	7,954	39.7	231	1.63	253	9
Comunitat Valenciana	141.7	7,049	1,087.9	54,118	33.7	1,678	0.99	140	8
Baleares	140.9	1,674	1,374.5	16,327	28.6	340	1.03	145	8
Canarias	73.1	1,613	721.0	15,913	11.4	252	0.92	67	6

Colour scale							
>150.0	Worst	Worst	Worst	Worst	Worst	>2.0	>150
0.0	Best	Best	Best	Best	Best	0.0	0

Table of current situation in Sweden regions. Colour scale is indicated in each legend.

Country	Reported data				Indexes		
	14-day attack rate /10 <sup>5</sup> inh.	Active cases (last 14 days)	Attack rate /10 <sup>5</sup> inh.	Cumulative cases	$\rho_7^{(1)}$	EPG <sup>(2)</sup>	Biocom-Cov degree
Jönköping	561.7	528	6,486.2	6,097	1.14	641	9
Örebro	467.3	729	2,554.5	3,985	1.34	627	9
Uppsala	422.7	727	3,065.1	5,272	1.13	478	9
Kalmar	291.7	105	2,922.2	1,052	2.30	670	9
Jämtland	171.5	223	1,231.5	1,601	0.62	106	8
Stockholm	156.9	3,677	1,315.6	30,838	1.44	226	8
Östergötland	153.2	708	1,074.5	4,964	1.45	222	8
Kronoberg	130.0	260	1,039.5	2,079	2.06	268	8
Skåne	125.0	1,703	595.2	8,106	1.97	246	8
Dalarna	104.9	301	1,042.5	2,992	1.33	139	8
Västmanland	102.2	280	1,292.7	3,542	1.12	114	8
Västra Götaland	92.5	1,581	1,313.3	22,457	1.44	133	8
Norrbottn	91.2	228	825.2	2,063	1.13	103	7
Halland	91.2	300	937.4	3,084	1.17	106	7
Södermanland	73.0	187	1,080.5	2,766	1.31	95	7
Gotland	55.9	33	650.8	384	0.75	42	6
Värmland	54.4	153	531.3	1,493	1.56	85	6
Gävleborg	51.6	148	1,270.0	3,645	1.07	55	6
Blekinge	50.0	80	563.8	902	1.04	52	6
Västerbotten	39.8	109	444.2	1,217	0.96	38	5
Västernorrland	33.9	83	838.8	2,055	1.17	40	5

Colour scale					
>150.0	Worst	Worst	Worst	>2.0	>150
0.0	Best	Best	Best	0.0	0

Table of current situation in Belgium regions. Colour scale is indicated in each legend.

<sup>3</sup> <https://github.com/ec-jrc/COVID-19/tree/master/data-by-region>

Country	Reported data						Indexes		
	14-day attack rate /10 <sup>5</sup> inh.	Active cases (last 14 days)	Attack rate /10 <sup>5</sup> inh.	Cumulative cases	Mortality /10 <sup>5</sup> inh.	Cumulative deaths	$\rho_7^{(1)}$	EPG <sup>(2)</sup>	Biocom-Cov degree
Wallonia	1,713.0	62,420	2,976.2	108,452	103.0	3,753	1.37	2,343	9
Brussels	1,570.8	18,975	3,484.9	42,097	137.2	1,657	1.27	1,991	9
Flanders	659.5	43,454	1,735.7	114,368	78.6	5,178	1.43	945	9

Colour scale								
>150.0	Worst	Worst	Worst	Worst	Worst	Worst	>2.0	>150
0.0	Best	Best	Best	Best	Best	Best	0.0	0

Table of current situation in Italy regions. Colour scale is indicated in each legend.

Country	Reported data						Indexes		
	14-day attack rate /10 <sup>5</sup> inh.	Active cases (last 14 days)	Attack rate /10 <sup>5</sup> inh.	Cumulative cases	Mortality /10 <sup>5</sup> inh.	Cumulative deaths	$\rho_7^{(1)}$	EPG <sup>(2)</sup>	Biocom-Cov degree
Valle d'Aosta	725.4	914	1,838.1	2,316	118.3	149	2.02	1,462	9
Liguria	431.3	6,689	1,377.1	21,359	108.3	1,680	1.39	601	9
Bolzano	370.4	1,930	1,116.7	5,818	56.8	296	1.75	647	9
Umbria	368.5	3,250	715.1	6,307	11.3	100	1.49	548	9
Lombardia	325.9	32,793	1,427.7	143,645	170.5	17,159	1.69	550	9
Piemonte	323.8	14,105	1,186.9	51,700	97.2	4,236	1.82	589	9
Campania	294.2	17,072	591.3	34,305	9.7	563	1.60	470	9
Toscana	289.7	10,806	748.0	27,901	33.2	1,237	1.48	430	9
Veneto	216.8	10,636	838.6	41,140	47.0	2,308	1.50	325	9
Trento	210.4	1,132	1,398.9	7,526	78.6	423	2.08	437	9
Lazio	202.0	11,875	527.5	31,010	18.4	1,081	1.75	353	9
Abruzzo	185.9	2,439	558.3	7,325	38.3	503	1.40	259	9
Friuli Venezia Giulia	174.9	2,125	610.3	7,415	30.4	369	1.39	242	9
Emilia-Romagna	167.1	7,451	995.0	44,365	102.0	4,547	1.43	240	9
Sardegna	152.0	2,493	441.2	7,235	11.0	181	1.30	198	8
Marche	147.3	2,246	698.0	10,645	65.6	1,000	1.55	229	9
Molise	138.9	425	368.0	1,126	8.5	26	1.20	167	8
Sicilia	132.1	6,604	306.3	15,316	8.2	408	1.38	182	8
Puglia	106.3	4,284	332.6	13,400	16.0	646	1.37	145	8
Basilicata	102.0	573	279.4	1,570	7.5	42	1.85	189	8
Calabria	64.6	1,257	176.9	3,445	5.4	105	1.78	115	7

Colour scale								
>150.0	Worst	Worst	Worst	Worst	Worst	Worst	>2.0	>150
0.0	Best	Best	Best	Best	Best	Best	0.0	0

## Situation and trends in other countries

Country	Reported data						Indexes		
	14-day attack rate /10 <sup>5</sup> inh.	Active cases (last 14 days)	Attack rate /10 <sup>5</sup> inh.	Cumulative cases	Mortality /10 <sup>5</sup> inh.	Cumulative deaths	$\rho_7^{(1)}$	EPG <sup>(2)</sup>	Biocom-Cov degree
Argentina	436.5	197,281	2,331.3	1,053,637	61.9	27,957	1.11	483	9
Israel	256.2	22,179	3,565.0	308,572	26.8	2,319	0.63	162	8
United States of America	242.2	801,746	2,540.3	8,408,340	67.4	223,042	1.10	267	9
Colombia	204.6	104,091	1,946.2	990,270	58.2	29,636	1.02	209	9
Ukraine	178.7	78,145	738.3	322,879	13.8	6,043	1.03	184	8
Russia	139.2	203,194	1,002.7	1,463,306	17.3	25,242	1.11	154	8
Brazil	138.9	295,186	2,504.5	5,323,630	73.3	155,900	1.11	154	8
Peru	125.1	41,262	2,668.6	879,876	103.1	33,984	1.01	126	8
Iraq	118.3	47,598	1,099.3	442,164	26.0	10,465	1.11	131	8
Chile	110.5	21,115	2,600.6	497,131	72.1	13,792	0.99	110	7
Qatar	106.5	3,068	4,528.3	130,462	7.9	228	1.13	120	8
Canada	89.0	33,589	554.1	209,148	26.1	9,862	1.02	90	7
Belarus	88.9	8,398	956.5	90,380	10.0	945	1.17	104	7
Iran	74.4	62,521	655.7	550,757	37.7	31,650	1.07	80	7
Ecuador	64.6	11,406	886.8	156,451	70.8	12,500	1.11	72	6
India	63.2	855,161	573.6	7,761,312	8.7	117,306	0.89	56	6
Mexico	39.3	50,622	678.0	874,171	68.2	87,894	1.12	44	6
Philippines	29.2	32,019	332.1	363,888	6.2	6,783	0.92	27	4
Indonesia	20.8	56,977	138.0	377,541	4.7	12,959	0.99	21	4
Saudi Arabia	16.2	5,642	987.5	343,774	15.1	5,250	0.95	15	3
Pakistan	3.9	8,621	147.7	326,216	3.0	6,715	1.03	4	2

Colour scale								
>150.0	Worst	Worst	Worst	Worst	Worst	Worst	>2.0	>150
0.0	Best	Best	Best	Best	Best	Best	0.0	0

<sup>(1)</sup>  $\rho_7$  is the average of 7 consecutive  $\rho$ , but can still fluctuate. <sup>(2)</sup> EPG stands for Effective Growth Potential, which is the product of reported cumulative incidence of last 14 days per 10<sup>5</sup> inhabitants by  $\rho_7$  (empiric reproduction number). Biocom-Cov degree is an epidemiological situation scale based on the level of last week's mean daily new cases (<https://upcommons.upc.edu/handle/2117/189661>, <https://upcommons.upc.edu/handle/2117/189808>).

## Analysis: On the use of artificial intelligence to improve empiric prediction. A collaboration with Facebook AI (Part I).

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The pandemic has put forward the key question of modeling to assess the short medium and long-term evolution of COVID19 incidence and hospital resources. Computer and mathematical models come in very different flavors but different versions of them have been useful to evaluate the short-term evolution and the short-term requirements under some specific situations.

In this assessment we review the models that can be useful to assess the evolution of the epidemics, the different time scale of prediction and the problems that those models have to overcome to predict properly medium and long-term scenarios. Finally, we argue that a key aim of the models should be to assess quantitatively what is going to be the evolution of the epidemics in the following 2-3 weeks unconditionally and that empiric artificial intelligence models provide a good framework to advance in this direction.

### Types of models

First, we divide the different models according to the type of general idea behind them. We classify here the models as mechanistic aiming for unconditional prediction, empirical aiming for unconditional prediction, and scenario-model aiming for conditional predictions.

**Mechanistic models:** These are models where the process of infection and social interactions is tried to be modeled as accurate as possible in a computer following mathematical equations of behavior rules. Real populations are presented with interactions that try to reproduce reality, and the evolution of the virus and its infection process is also reproduced in order to obtain a mechanistic evolution of the disease. Models can include randomness in some of its features and average behavior can be assessed. A brilliant example of this type of models and insights is the recently published model in PNAS by Mario Castro, Saúl Ares, José A. Cuesta, and Susanna Manrubia<sup>4</sup> analyzing the present predictability limit of such models

**Empiric models:** These models do not try to reproduce the mechanics of the disease but use all the data available regarding incidence, mobility data, levels of hospitalizations, PCR testing level, in order to evaluate how the system behaved in the past. Trying to unveil of how the system responded or behaved in the past allows to make prediction about how the system will behave in the future. As an example, the empirical model developed by the group and accepted recently in PLOS Computational Biology using Gompertz empiric function<sup>5</sup>.

**Scenario/structural models:** These models do not try to reproduce accurate the mechanistic nature of the epidemics either because of its simplicity or because, despite being complex, a significant number of key parameters in the evolution of the epidemics is unknown. In these cases, these models allow to gain insight on key features of the epidemics and put forward possible scenarios of the pandemic normally in the medium and long-term with the conditionality that the parameters or the structure of the description of the epidemics are correct. A classic example of these is the report in Science “Projecting the transmission dynamics of SARS-CoV-2 through the postpandemic period”<sup>6</sup>.

### Temporal scale of the predictions

Different models normally aim at different time scales of prediction. We list now the basic time scales of the epidemics and how the effects involved in its evolution appear.

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<sup>4</sup> <https://www.pnas.org/content/early/2020/09/30/2007868117>

<sup>5</sup> <https://upcommons.upc.edu/handle/2117/188714>

<sup>6</sup> <https://science.sciencemag.org/content/368/6493/860>



**One-week scale (short-term):** This time scale is the characteristic time of infection cycle with people, on average, having 4-7 days without symptoms before the onset of the disease for those symptomatic. So, predicting at one-week scale is related with the ability to project from present level of infections the next generation of infected people. Given that at this time scale no other issues are involved except for the infection pattern, mechanistic and empirical model have been developed to predict accurately at this time scale (see our recently accepted paper for example).

**Three/four-week time scale (medium-term):** This time scale is the relevant one both in the delays between infection, bad prognosis and death, and also the time scale at which intervention changes from health officials can have an effect. In some countries, we must add mobility and interaction patterns can also change at the one-month or two months scale. In southern Europe mobility changes strongly in different key dates related with work, school, holidays and weather, for example. In this sense changes in mobility and weather might have already an effect at this time scale.

**Three/six-month time scale (long-term):** At this time scale not only the effect of short-term interventions, mobility and possible weather effects are incorporated but also the evolution of the perception of risk and general behavior of the population might have changed. Similarly, development of new drugs or treatments can influence these perceptions.

### **Discussion of models and temporal scales**

The state of the art of modeling, at present, does not allow any quantitative prediction at the three-month / half-year with any degree of accuracy. As far as we understand, small changes in the behavior can have major effect over time. On the other hand, major events like the development of drugs, the effect of message campaigns, the improvement of epidemiological surveillance can hardly be predicted at all. Actually, even putting any kind probability to its success or development seems impossible to us. We do not have pass to compare with as prediction of political outcomes in elections have.

At the three-month/half a year time scale we can only have scenarios where different possibilities are assessed regarding the influence of weather, mobility, personal behavior and epidemiological surveillance trying to assess when it is more probably to have large increases incidence. A very important recent paper (Saul Ares in PNAS) points out to the impossibility of rendering accurate prediction with a horizon larger than one month.

On the other hand, prediction at the one-week scale have been already been developed, with both mechanistic and empirical models producing very similar results. The reason is that mechanistic and empirical model both need to be calibrated in a certain sense given some major unknowns in this epidemic. As of know the key unknowns for mechanistic models are the fraction of asymptomatic, the evolution of infection capabilities according to age and symptoms and the relevance of the infections that are not at very close contact but at 2m-5m length scale. All of them have to be parametrized and calibrated, rendering mechanistic models very close to empirical models right now.

Parametrization of mechanistic models can provide key insights regarding the major unknowns of the disease process and we hope that soon the key features of the transmission will be unveiled. This will allow for reliable one-week prediction are something more than empirical models.

### **Actual need of medium-term predictions**

With this framework in mind, the key goal should be to develop a model that can go further than one week, where mobility, weather and interventions can be assessed even at the probabilistically or empirical level. The development of mechanistic models that take into account all these effects is impossible right now. Even in the case that mechanistic models can be deployed accurately to model infection propagation with most of



the parameters of the disease known, the effect of mobility, weather and human behavior is out of the scope of them. In other words, medium-term predictions have to be analyzed, so far, with scenario/structural models. In this sense, accurate short-term mechanistic models may play the role of scenario-models in medium-term prediction. This is, they can provide conditional predictions. In other words, they might predict properly if there is no change in the legislative framework, human behavior in assessing risk or environmental effects.

Still, our input from health officials is that they wish/require precisely this three-week/one month prediction in unconditional terms. This is, they would like to know the evolution of the epidemics for a given set of health measures.

We are, again, with the same problem that mechanistic models faced when the epidemics started, with a general lack of data on how movement restrictions or other type of legislation affect the evolution of the disease. Similarly, weather prediction can be incorporated still with the deep lack of knowledge on how humidity of temperature may (or might not) have influence on the evolution.

### **Proposal of a new type of model based in AI**

In this situation, our proposal is that the proper way to advance in the solution of this problem is to develop more complex empirical epidemiological model given the lack, again, of the proper parameters. However, in this situation, given the complexity of the problem one should use multiple data sets, since not only the number of new cases can be important. Hospitalization, levels of mobility and weather variables, among others, can be important. Furthermore, the evolution of the epidemics under different legislation measures requires comparisons of the evolution of one region/province with those that are neighbors and may have had in the past similar or different restrictions.

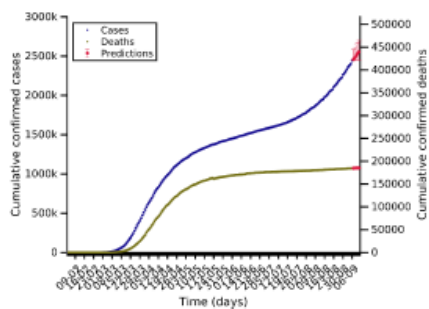
This leads us to an empirical framework where multiple data should be used and complex patterns be detected. However, empirical models with a large number of parameters will certainly have the problem of overfitting, giving the huge number of variables at play. So, the empirical model of choice must a rather robust training Artificial Intelligence plus a way to deal with the overfitting problem. With these two ingredients, one can try to train the Artificial Intelligence with European data or subnational data in European countries in order to check whether 3-week unconditional predictions are possible.

**We are glad to announce that we are now collaborating with Facebook AI to test how this type of modeling can work in the European Union. We will discuss our contributions and details of how we plan to extend and evaluate the forecasts to European countries in the next report.**

## Legend: Countries' reports details

Reported cumulative cases (blue) and deaths (brown), together with predictions (red)

EU+EFTA+UK 06-09-2020. Pop: 2632.4M. Cumulative incidence: 93/10<sup>5</sup>

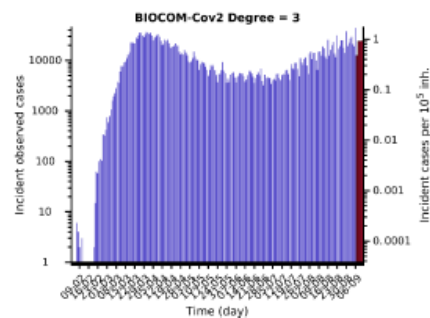
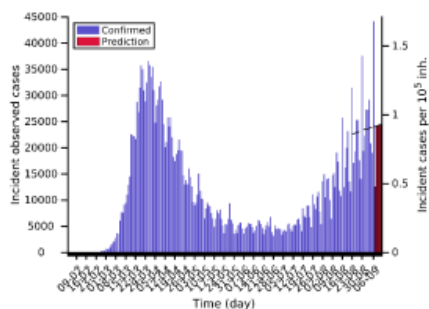


Predictions for next days		
Day	Number of cases	95% confidence interval
07-09-2020	2458068 (+125771)	[ 2445493 - 2583840 ]
09-09-2020	2568527 (+242758)	[ 2440483 - 2633890 ]
11-09-2020	2553558 (+244355)	[ 2440483 - 2799209 ]

Current indicators		
$R_{eff}$	RPI	CFR
1.3	14	1.17 %

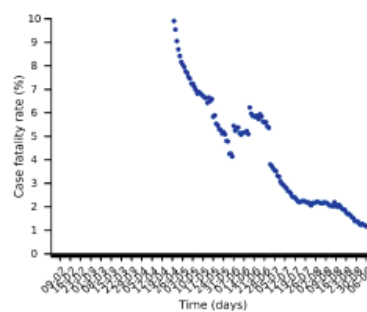
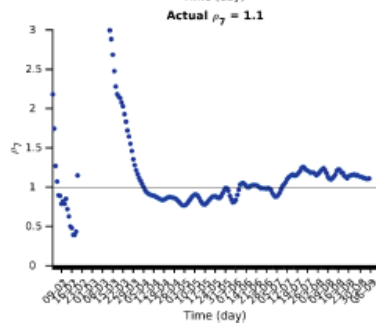
Predictions and indicators

Incident observed cases and predictions.



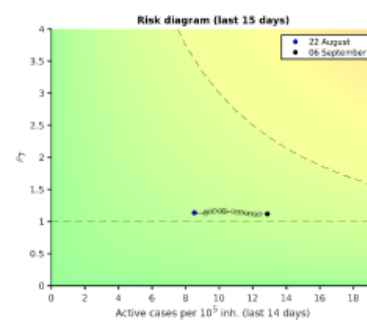
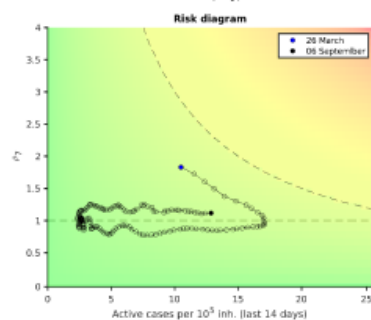
Incident observed cases in a logarithmic scale, with Biocom-Cov degree.

Evolution of empiric reproduction number  $\rho_T$



Case fatality rate

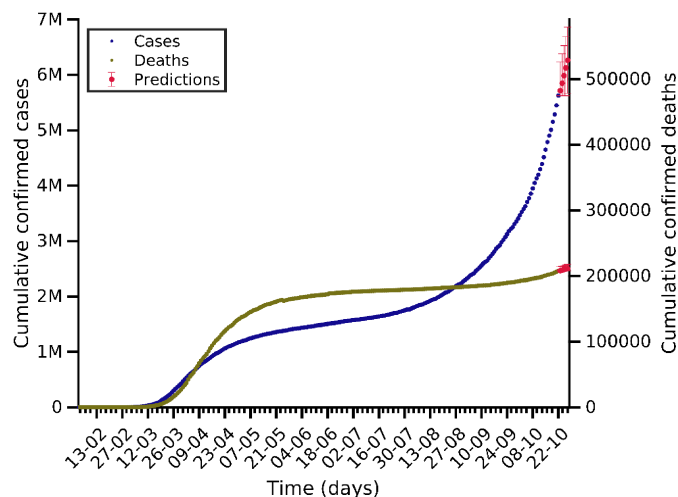
Risk diagram



Risk diagram of last 15 days

**(1) Analysis and prediction of COVID-19  
for EU+EFTA+UK**

# EU+EFTA+UK 22-10-2020. Pop: 527.9M. Cumulative incidence: 1066/10<sup>5</sup>

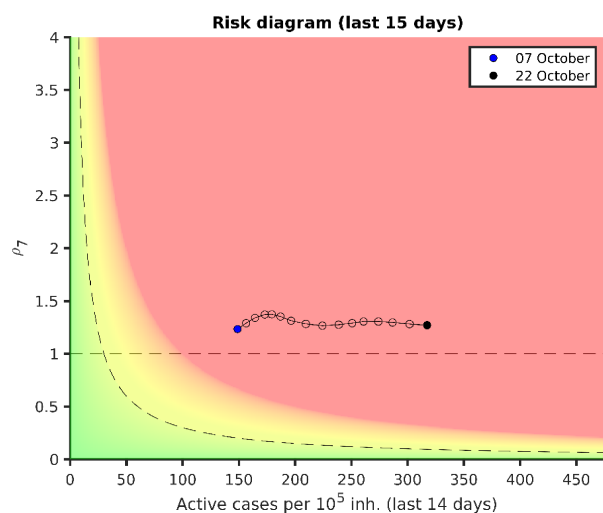
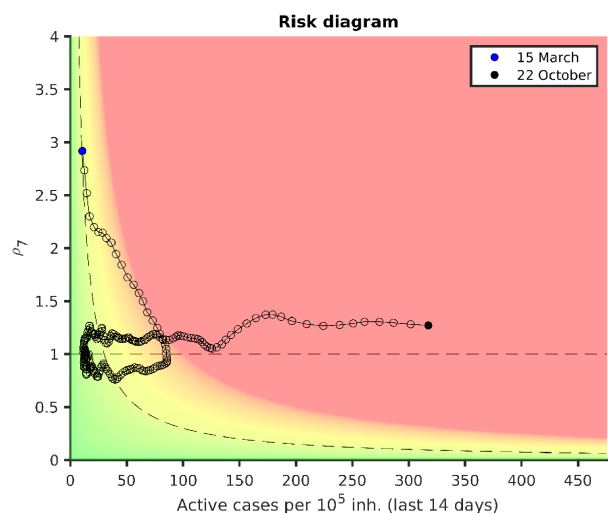
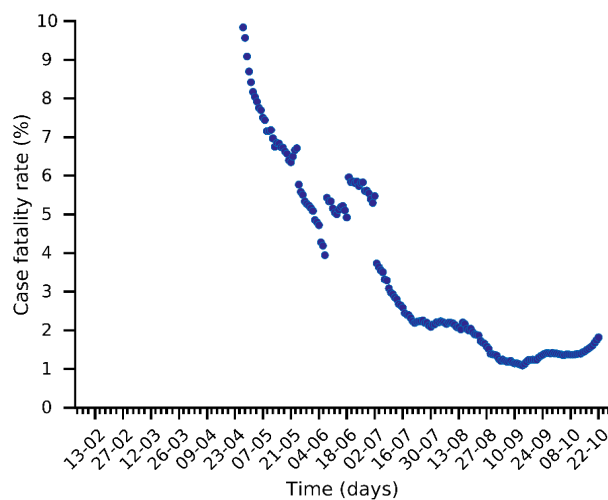
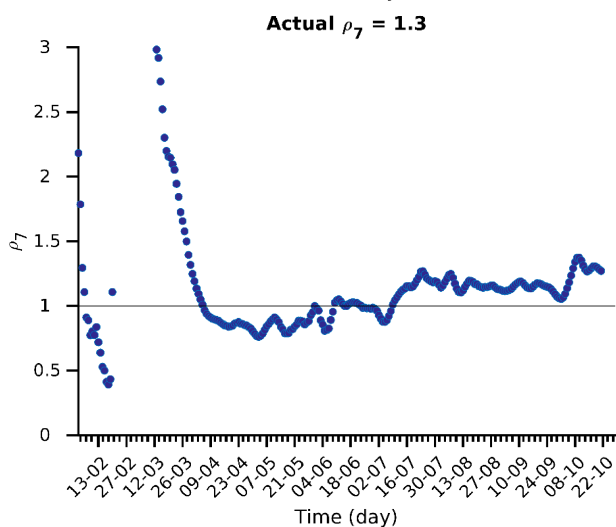
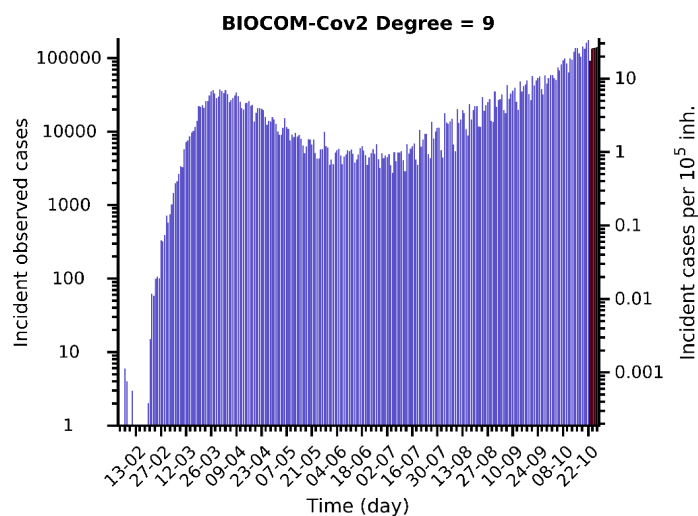
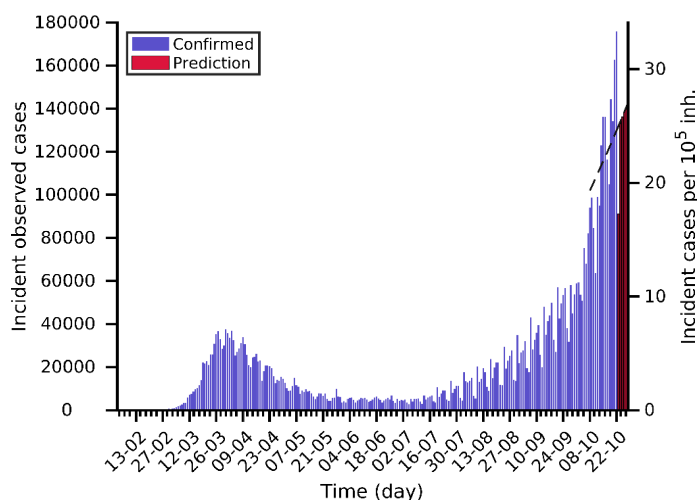


Predictions for next days

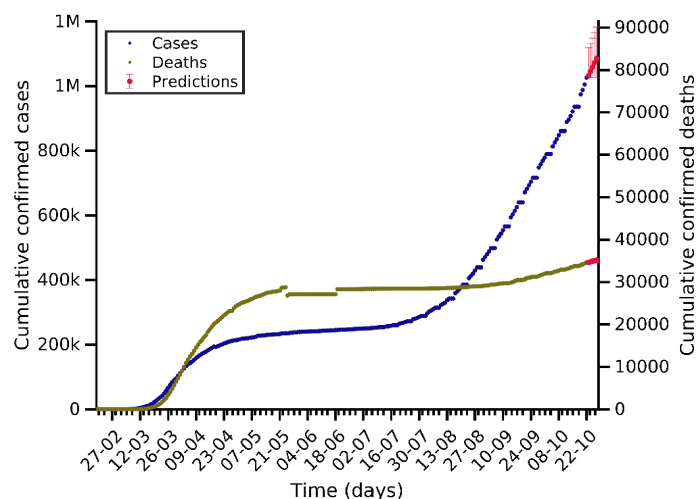
Day	Number of cases	95% Confidence Interval
23-10-2020	5716253 (+91202)	[ 5625051 - 6234542 ]
25-10-2020	5986480 (+136165)	[ 5625051 - 6529326 ]
27-10-2020	6265155 (+140397)	[ 5665891 - 6864419 ]

Current indicators

A <sub>14</sub>	EPG	CFR
317	403	1.82 %



# Spain 22-10-2020. Pop: 47.0M. Cumulative incidence: 2182/10<sup>5</sup>

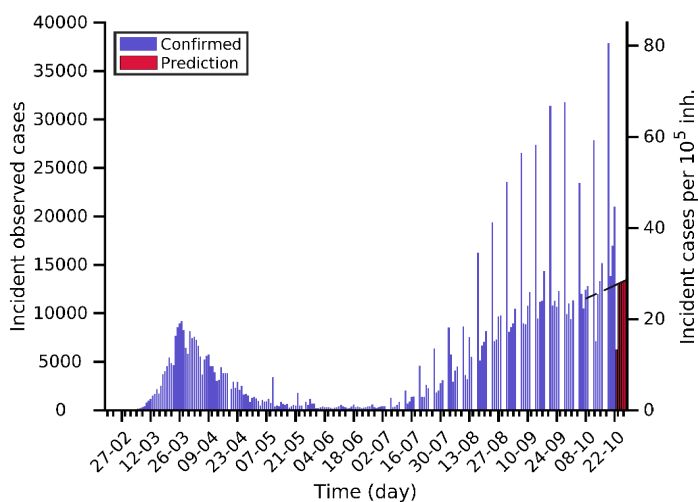


Predictions for next days

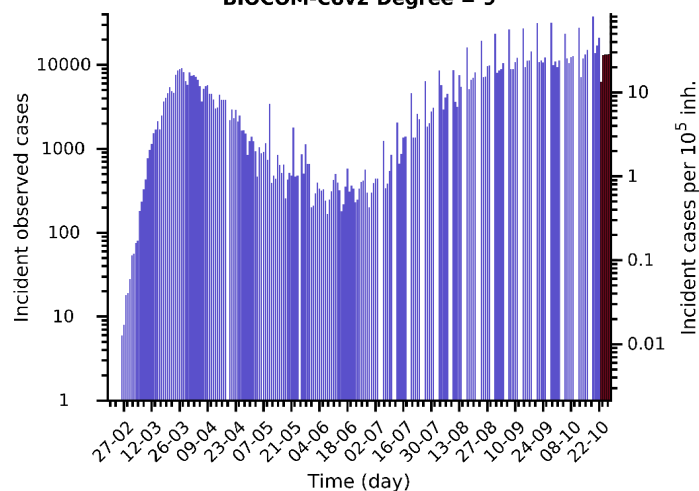
Day	Number of cases	95% Confidence Interval
23-10-2020	1032534 (+6253)	[ 1026281 - 1118599 ]
25-10-2020	1058763 (+13163)	[ 1026281 - 1148513 ]
27-10-2020	1085382 (+13358)	[ 1026281 - 1183283 ]

Current indicators

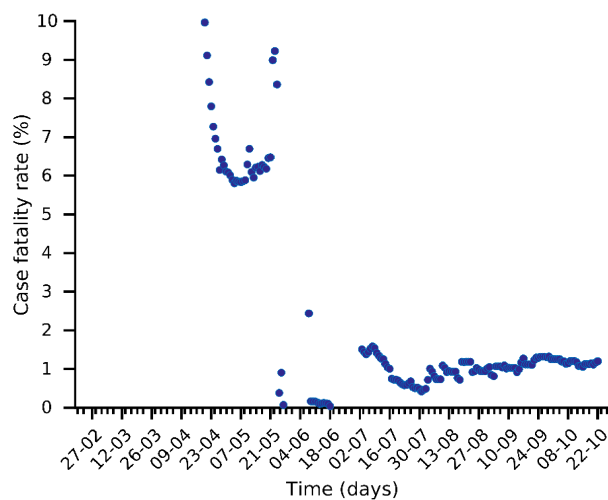
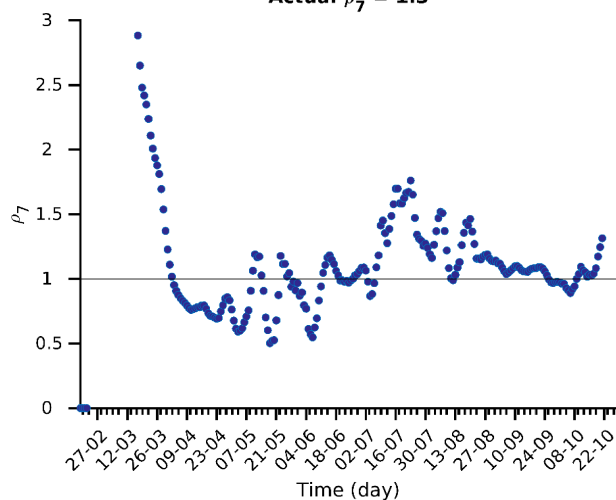
A <sub>14</sub>	EPG	CFR
378	497	1.20 %



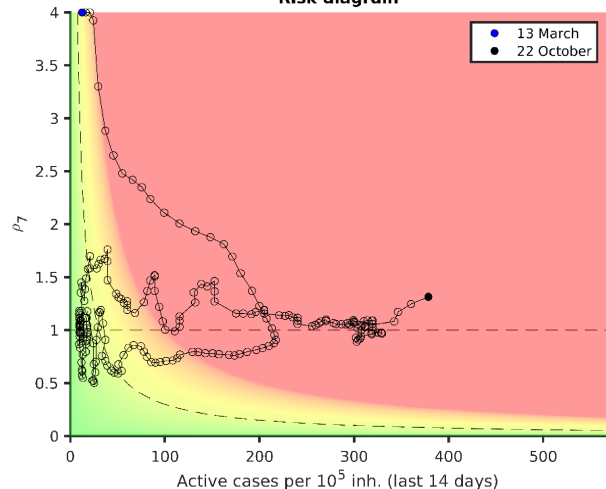
BIOCOM-Cov2 Degree = 9



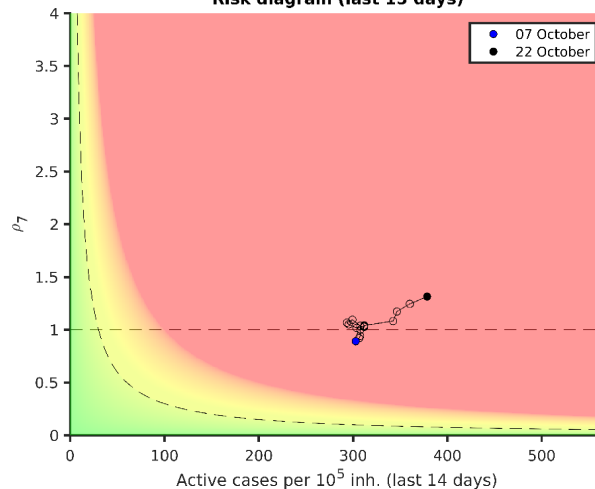
Actual  $\rho_7 = 1.3$



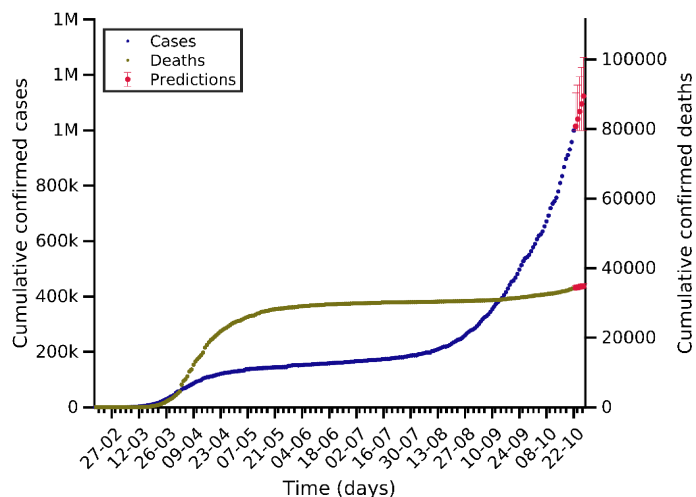
Risk diagram



Risk diagram (last 15 days)



# France 22-10-2020. Pop: 65.3M. Cumulative incidence: 1531/10<sup>5</sup>

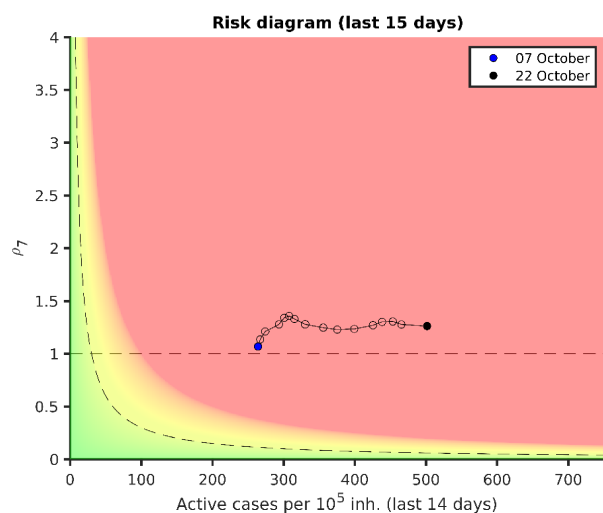
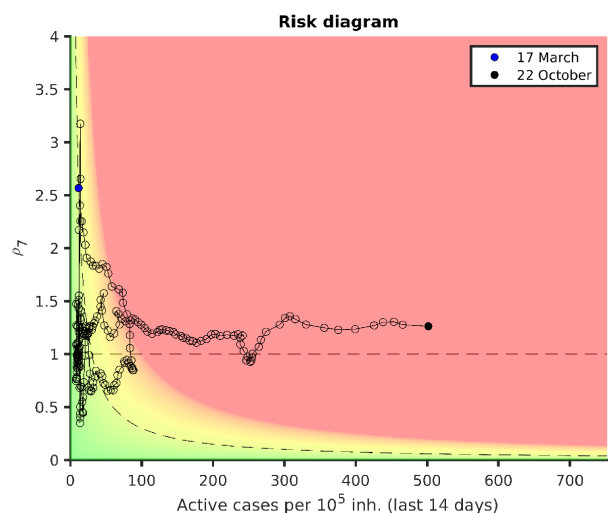
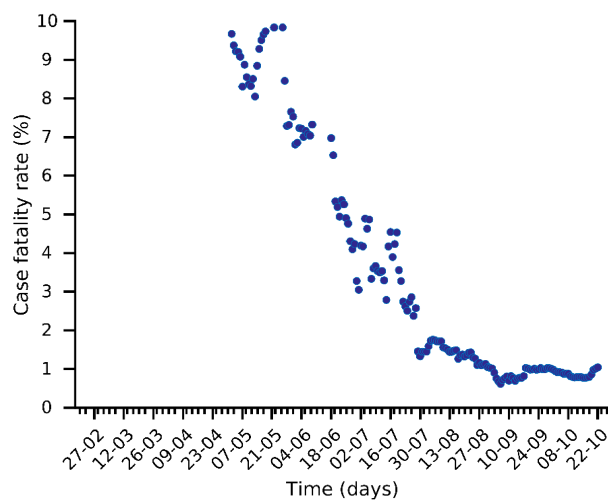
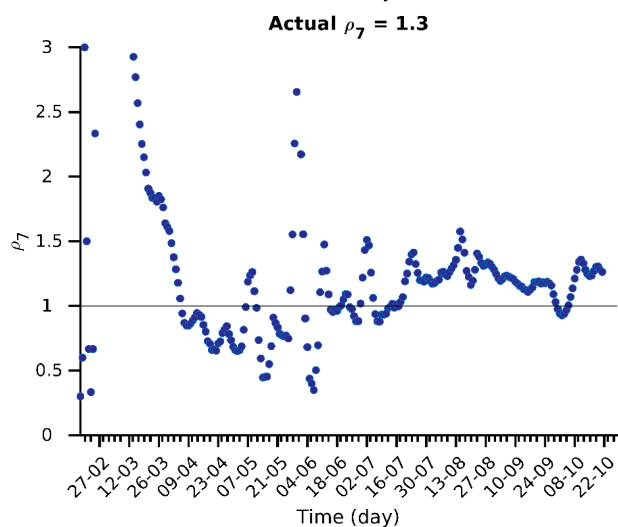
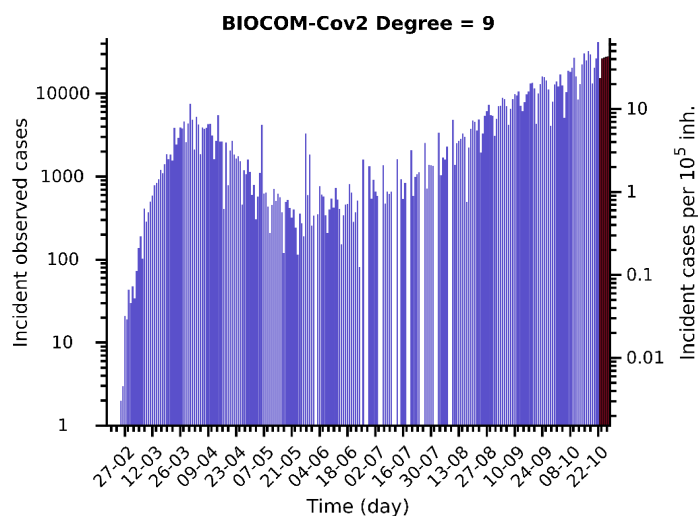
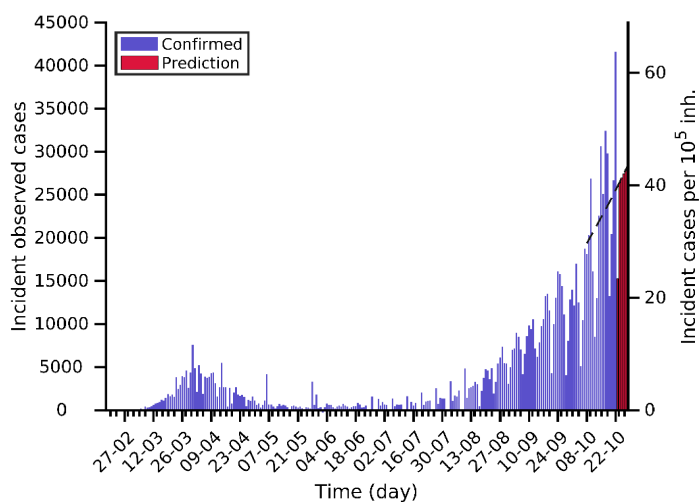


Predictions for next days

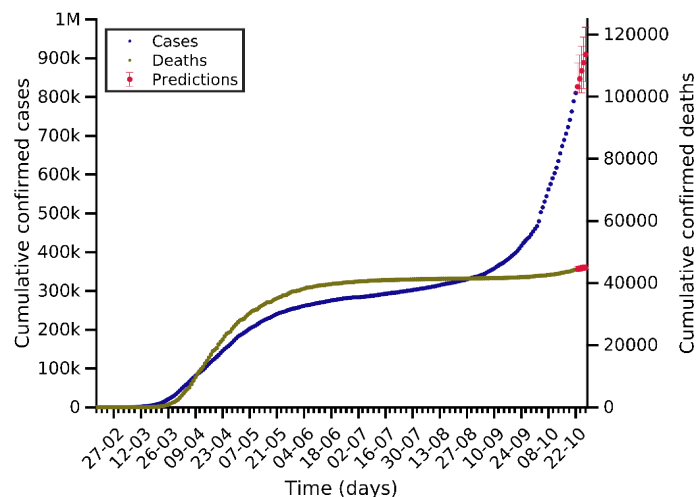
Day	Number of cases	95% Confidence Interval
23-10-2020	1014316 (+15273)	[ 999043 - 1134505 ]
25-10-2020	1067778 (+26968)	[ 999043 - 1193807 ]
27-10-2020	1123152 (+27927)	[ 999043 - 1262730 ]

Current indicators

A <sub>14</sub>	EPG	CFR
502	633	1.04 %



# UK 22-10-2020. Pop: 67.9M. Cumulative incidence: 1194/10<sup>5</sup>

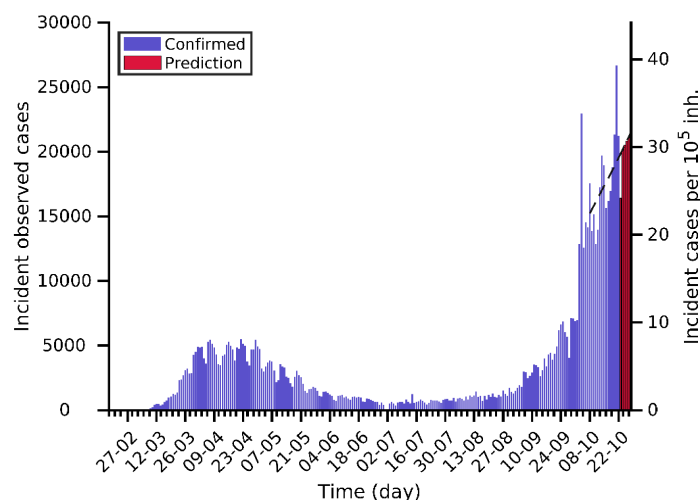


Predictions for next days

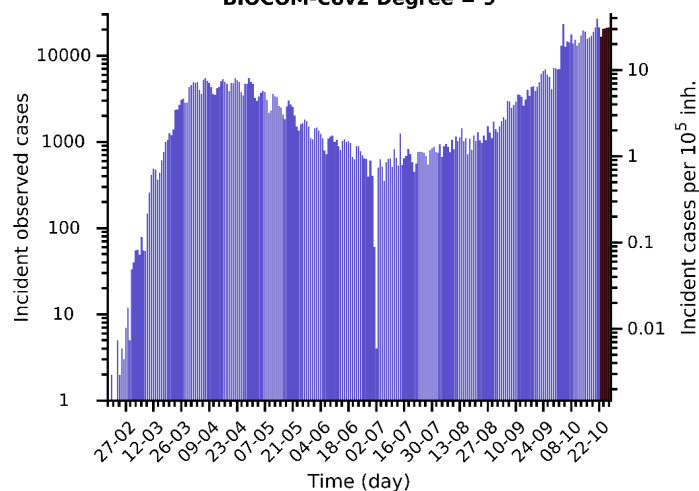
Day	Number of cases	95% Confidence Interval
23-10-2020	826890 (+16423)	[ 810467 - 887645 ]
25-10-2020	867587 (+20510)	[ 810467 - 931236 ]
27-10-2020	909578 (+21158)	[ 839267 - 979890 ]

Current indicators

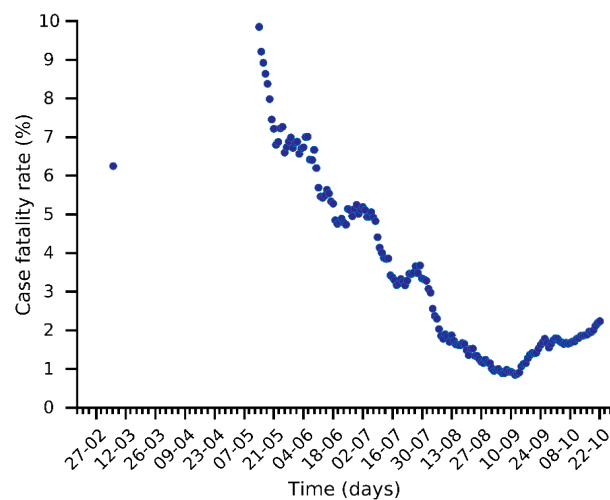
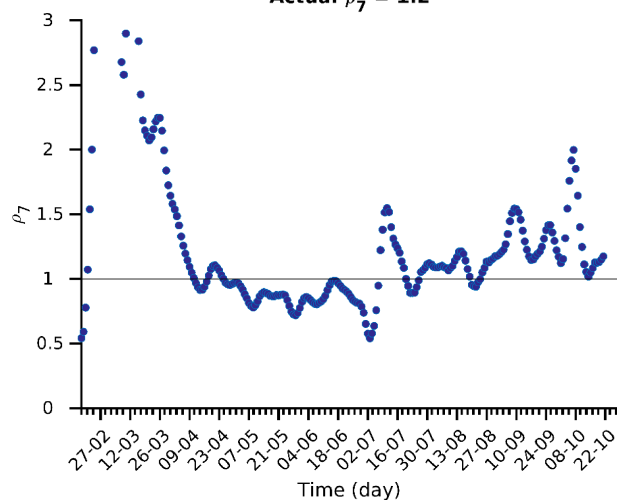
A <sub>14</sub>	EPG	CFR
366	430	2.23 %



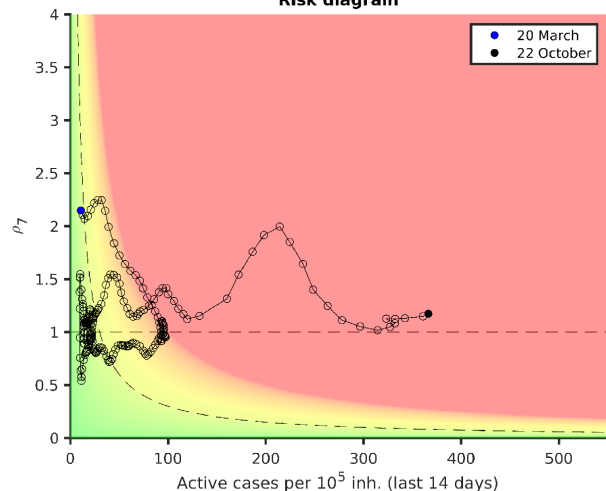
BIOCOM-Cov2 Degree = 9



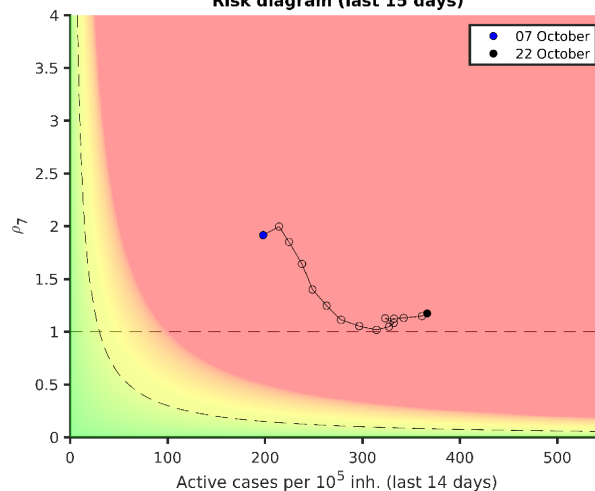
Actual  $\rho_7 = 1.2$



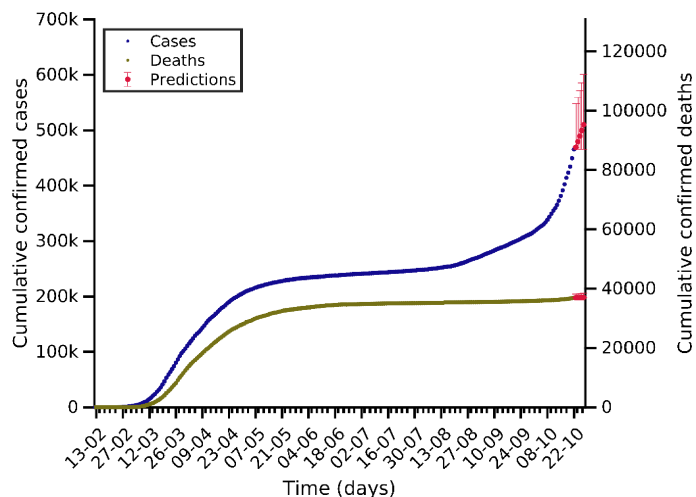
Risk diagram



Risk diagram (last 15 days)



# Italy 22-10-2020. Pop: 60.5M. Cumulative incidence: 770/10<sup>5</sup>

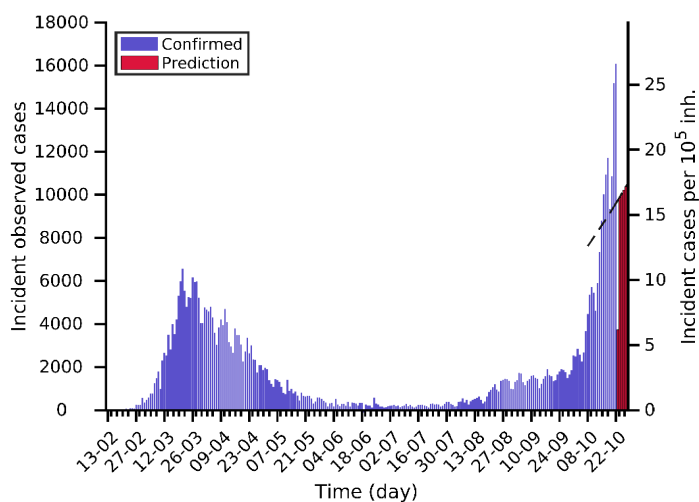


Predictions for next days

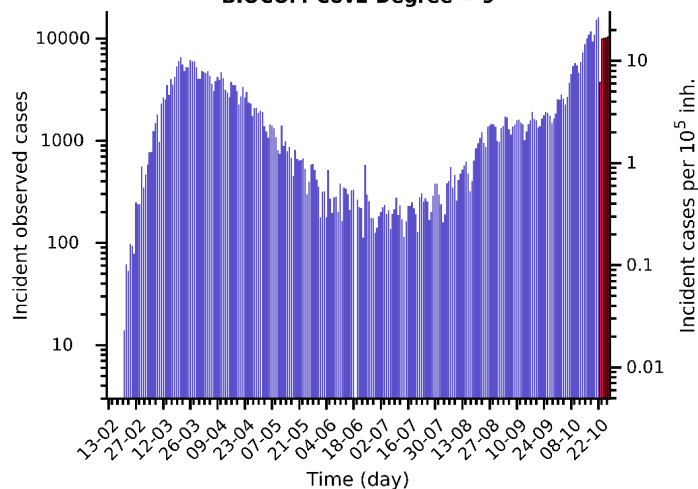
Day	Number of cases	95% Confidence Interval
23-10-2020	469456 (+3730)	[ 465726 - 548046 ]
25-10-2020	489431 (+10065)	[ 465726 - 571705 ]
27-10-2020	510028 (+10376)	[ 465726 - 600738 ]

Current indicators

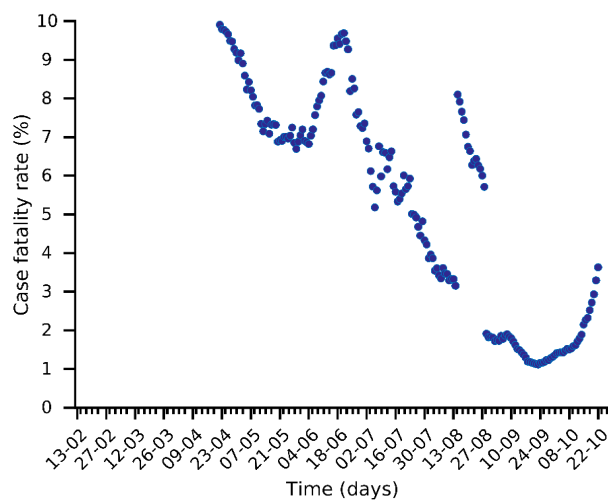
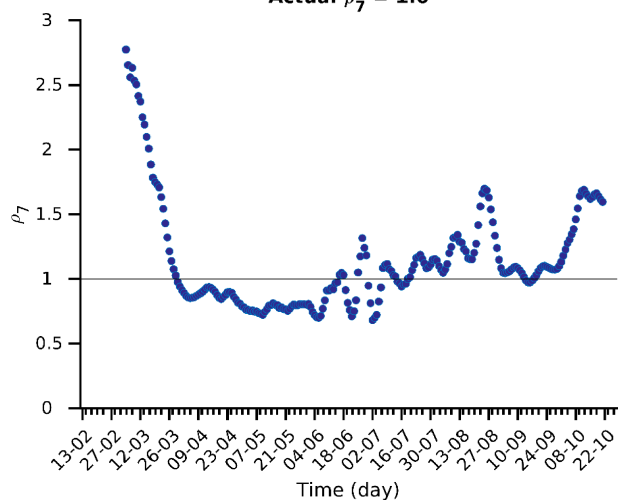
A <sub>14</sub>	EPG	CFR
211	336	3.63 %



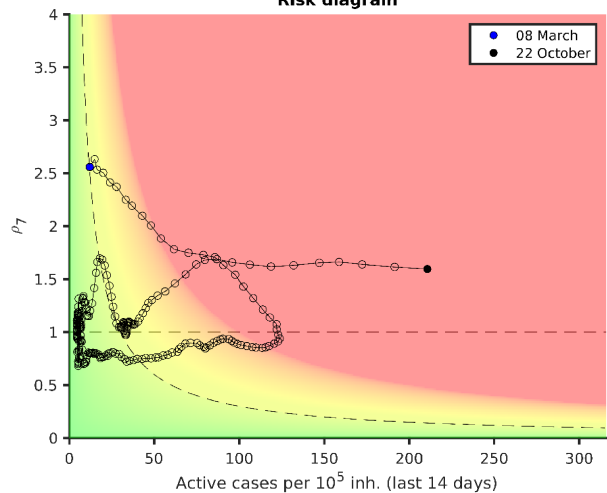
BIOCOM-Cov2 Degree = 9



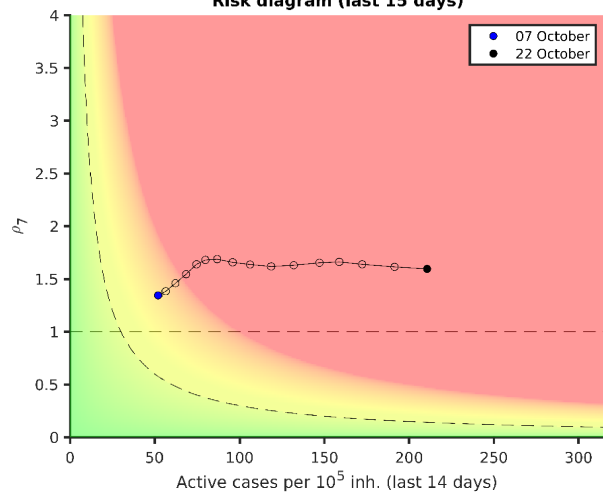
Actual  $\rho_7 = 1.6$



Risk diagram

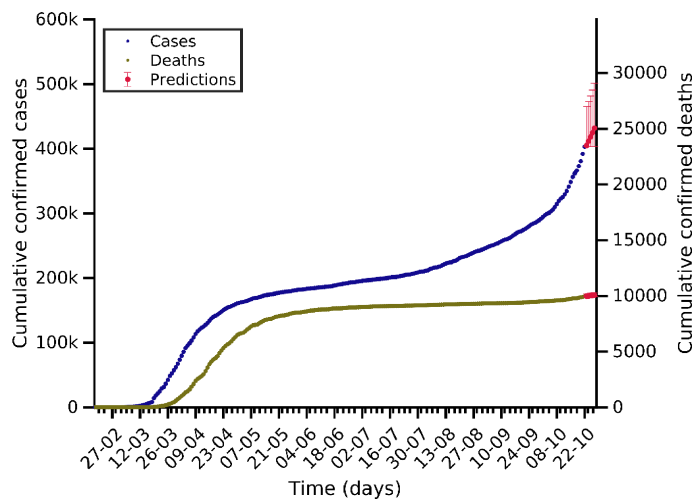


Risk diagram (last 15 days)





# Germany 22-10-2020. Pop: 83.8M. Cumulative incidence: 481/10<sup>5</sup>

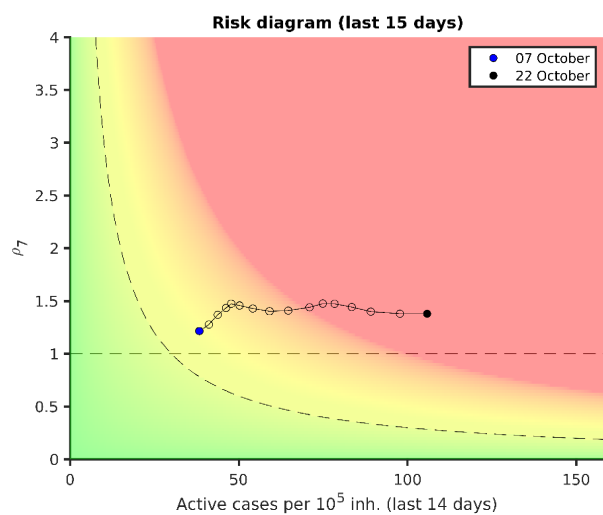
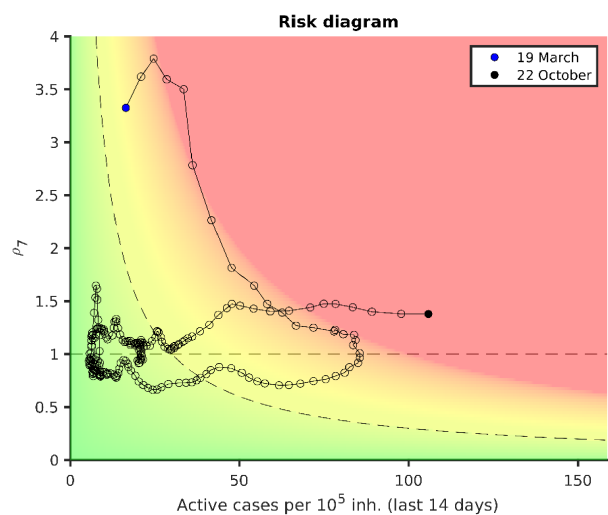
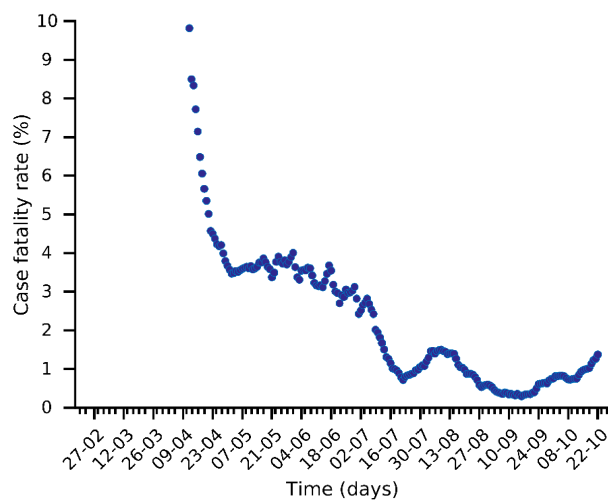
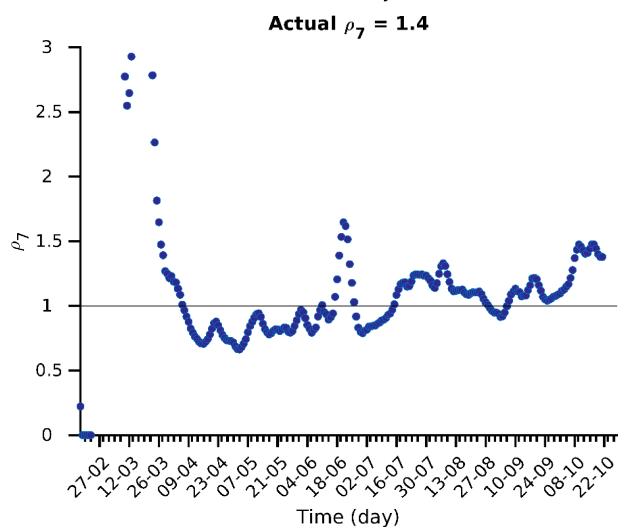
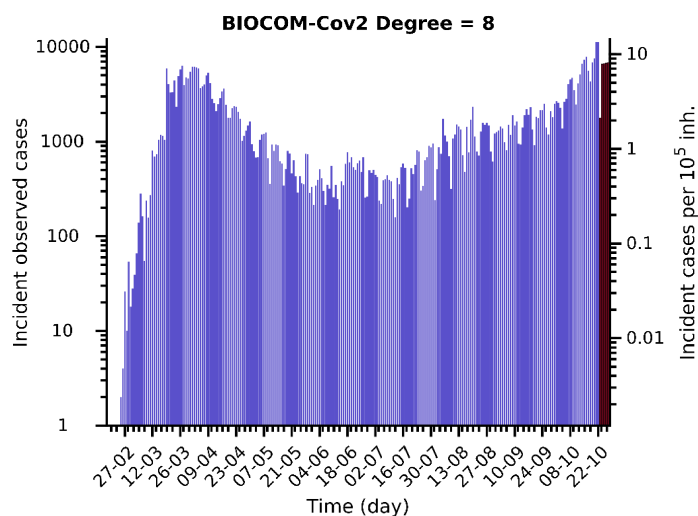
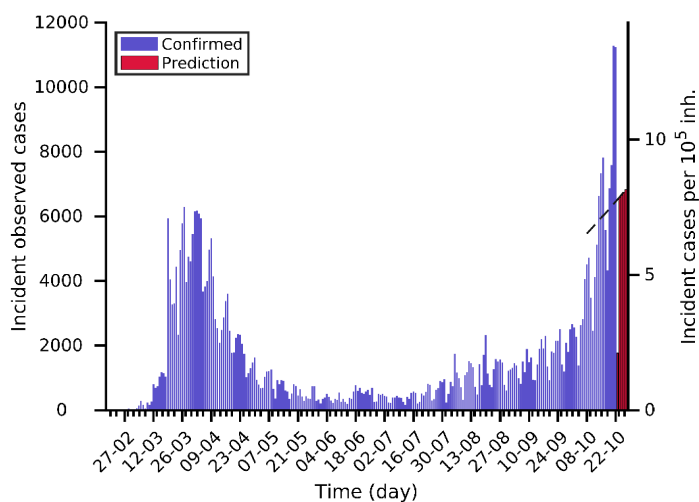


Predictions for next days

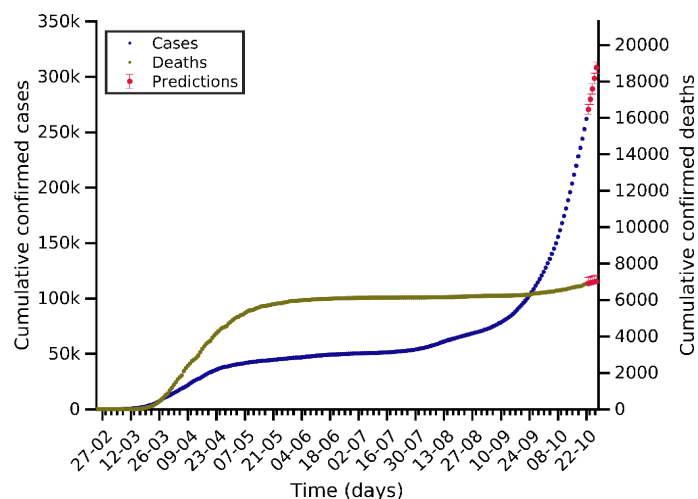
Day	Number of cases	95% Confidence Interval
23-10-2020	405064 (+1773)	[ 403291 - 465462 ]
25-10-2020	418346 (+6678)	[ 403291 - 481438 ]
27-10-2020	431924 (+6826)	[ 403291 - 501071 ]

Current indicators

A <sub>14</sub>	EPG	CFR
106	146	1.37 %



# Netherlands 22-10-2020. Pop: 17.1M. Cumulative incidence: 1530/10<sup>5</sup>

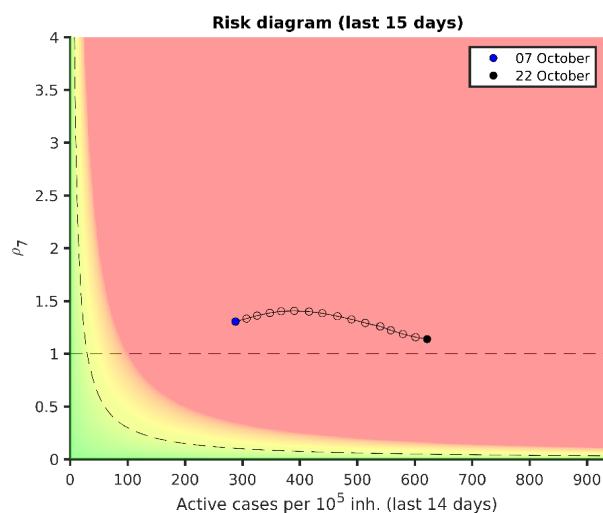
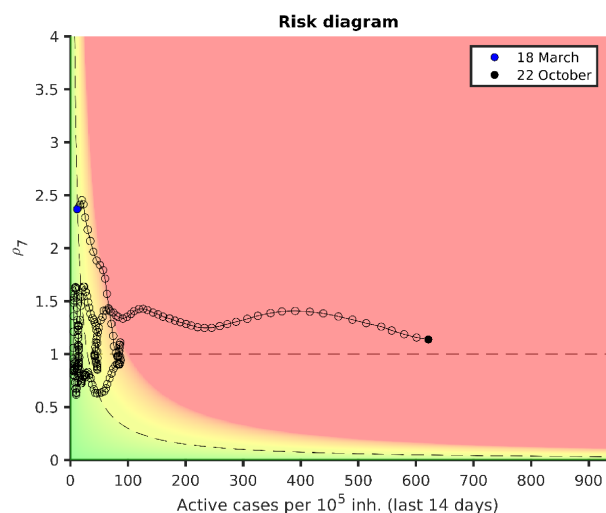
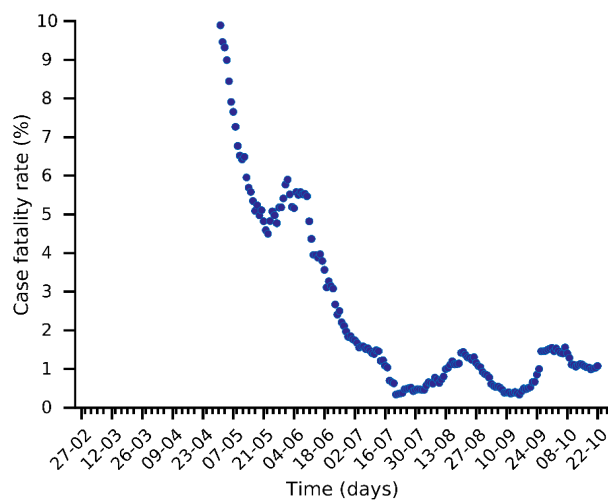
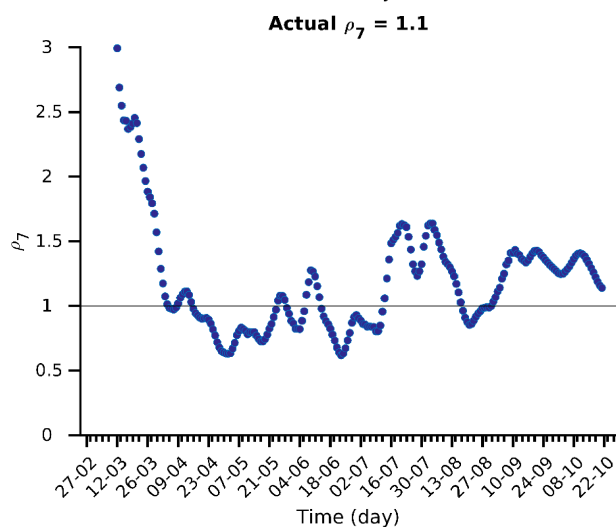
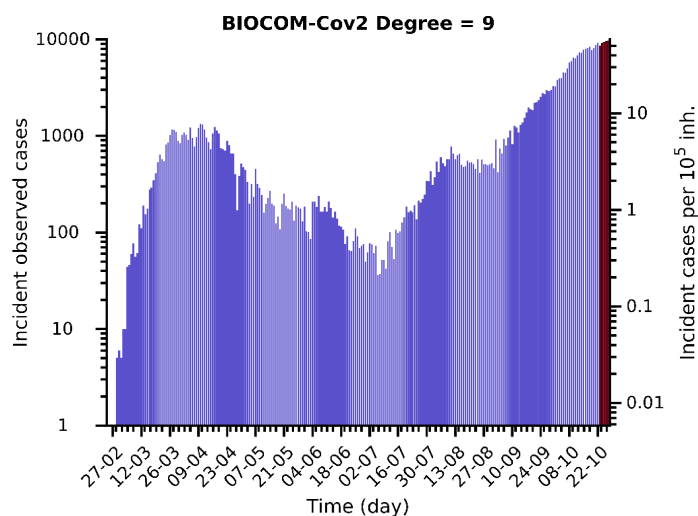
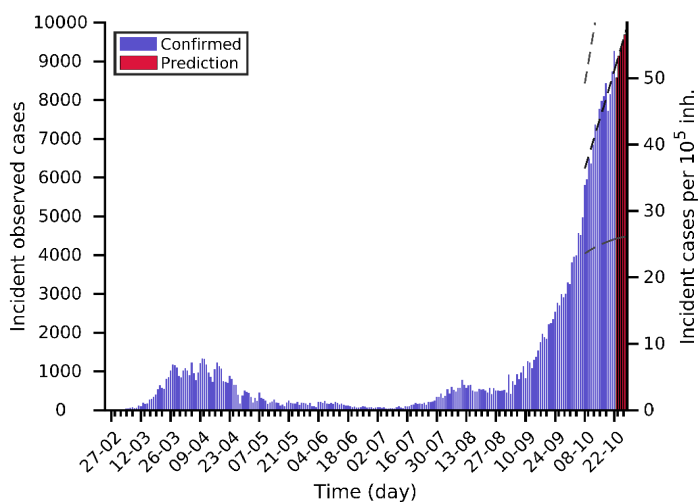


Predictions for next days

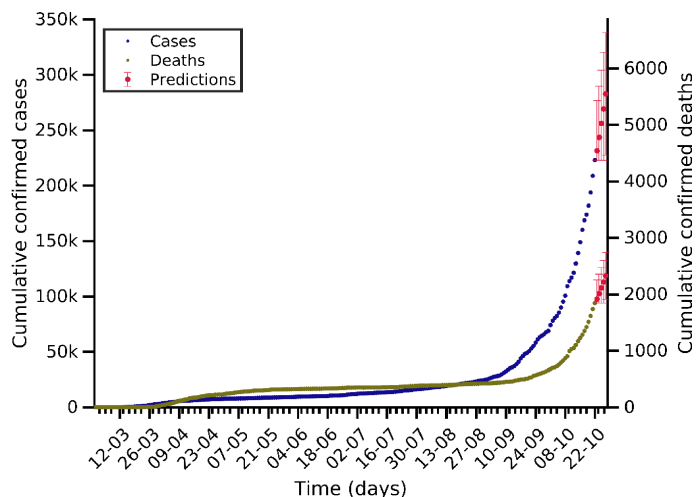
Day	Number of cases	95% Confidence Interval
23-10-2020	270686 (+8577)	[ 266237 - 275134 ]
25-10-2020	289145 (+9322)	[ 284469 - 293821 ]
27-10-2020	308340 (+9690)	[ 303131 - 313549 ]

Current indicators

A <sub>14</sub>	EPG	CFR
621	708	1.08 %



# Czech Rep 22-10-2020. Pop: 10.7M. Cumulative incidence: 2083/10<sup>5</sup>

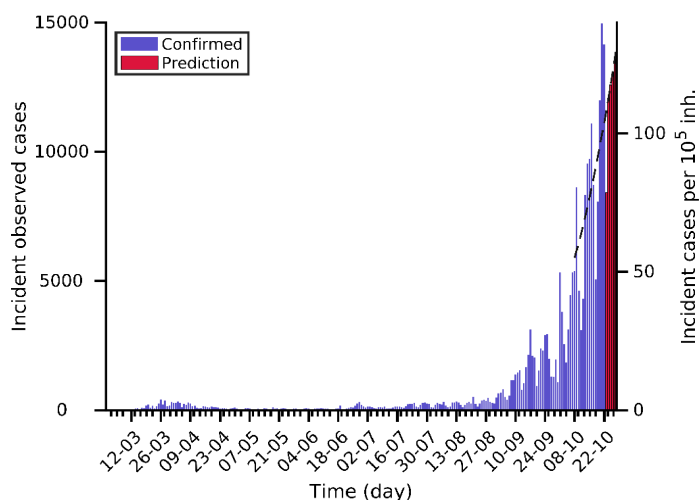


Predictions for next days

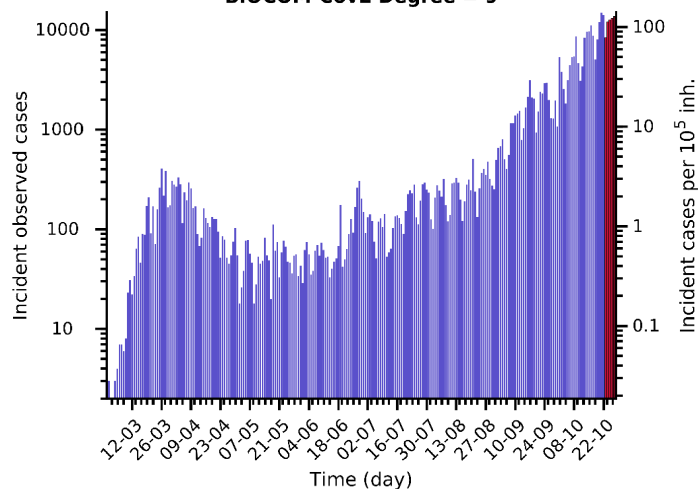
Day	Number of cases	95% Confidence Interval
23-10-2020	231479 (+8414)	[ 223065 - 276741 ]
25-10-2020	256145 (+12580)	[ 223065 - 304219 ]
27-10-2020	282840 (+13608)	[ 227622 - 338059 ]

Current indicators

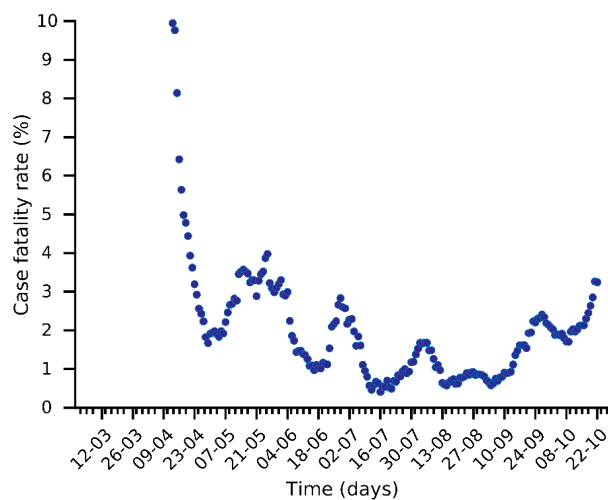
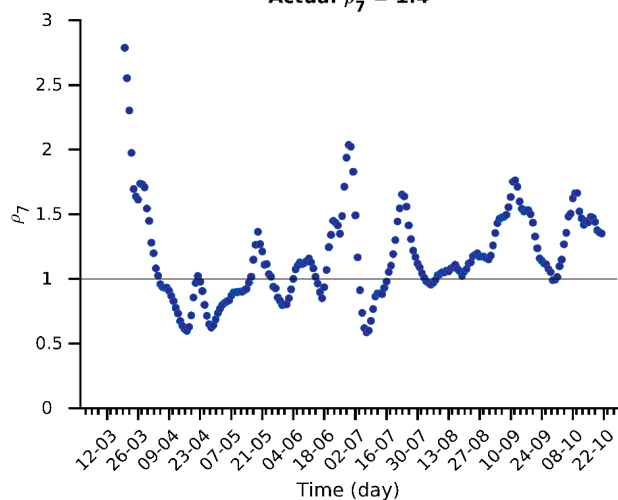
A <sub>14</sub>	EPG	CFR
1142	1544	3.24 %



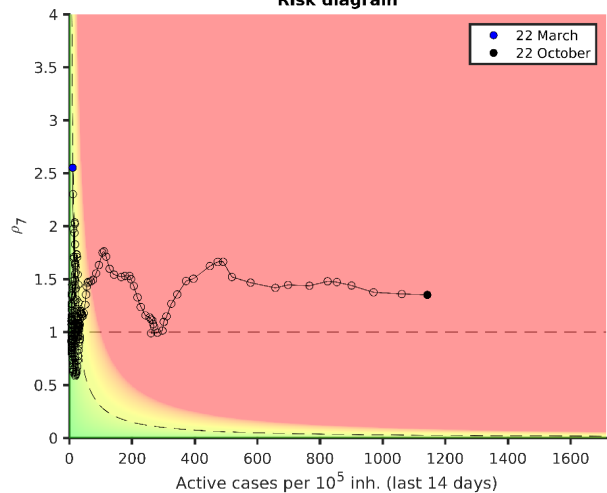
BIOCOM-Cov2 Degree = 9



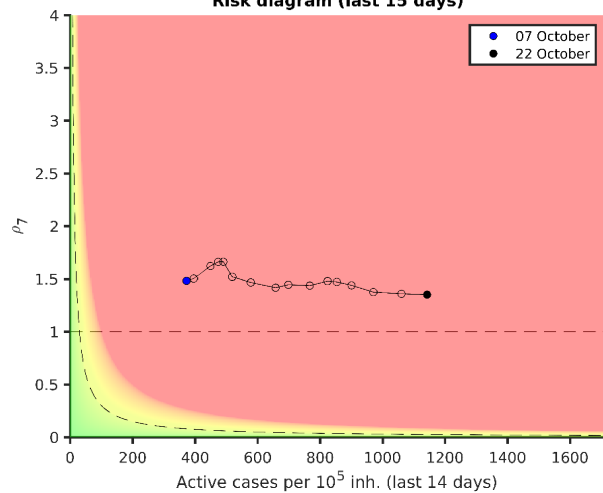
Actual  $\rho_7 = 1.4$



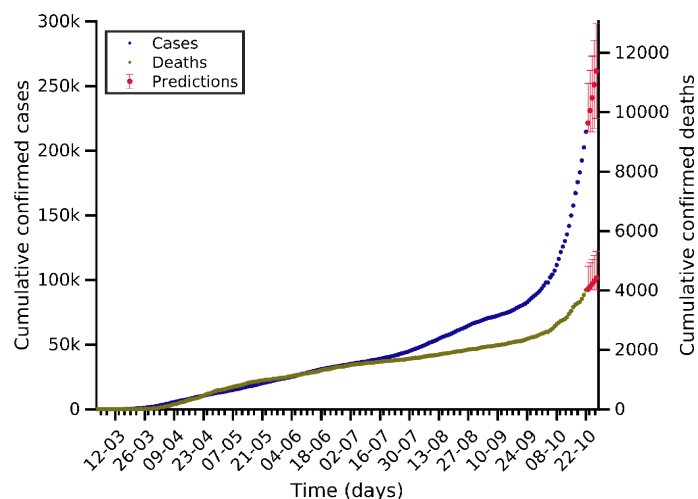
Risk diagram



Risk diagram (last 15 days)



# Poland 22-10-2020. Pop: 37.8M. Cumulative incidence: 567/10<sup>5</sup>

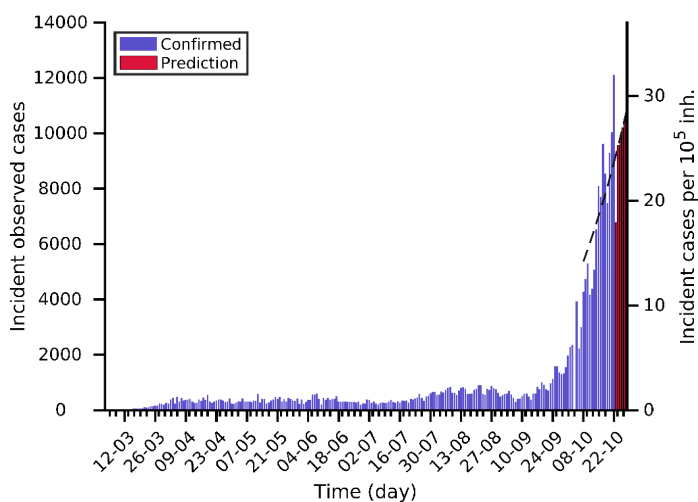


Predictions for next days

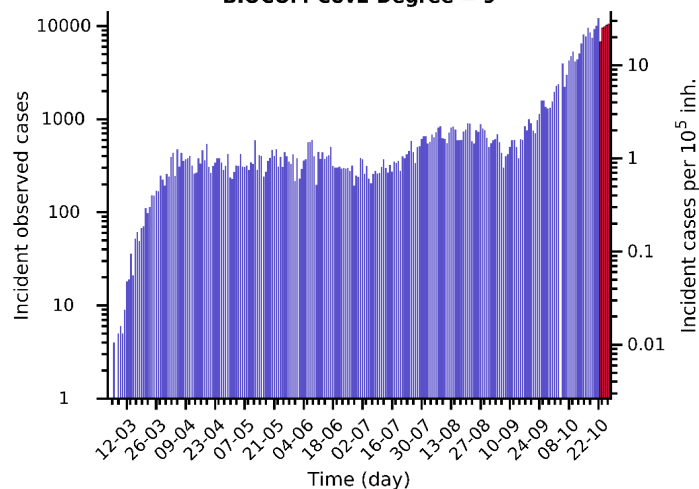
Day	Number of cases	95% Confidence Interval
23-10-2020	221467 (+6781)	[ 214686 - 252020 ]
25-10-2020	240894 (+9871)	[ 214686 - 273195 ]
27-10-2020	261604 (+10518)	[ 224994 - 298214 ]

Current indicators

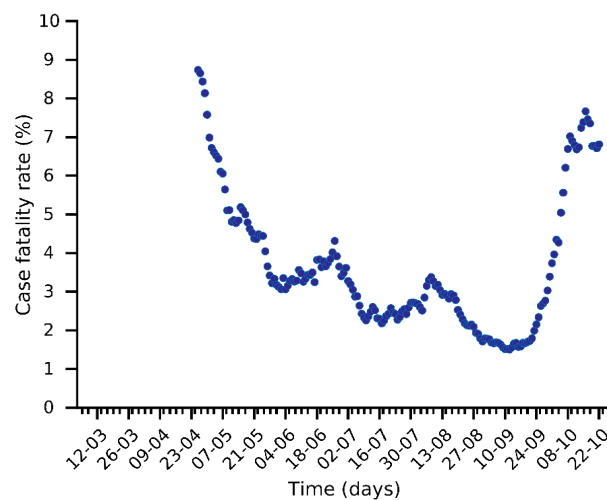
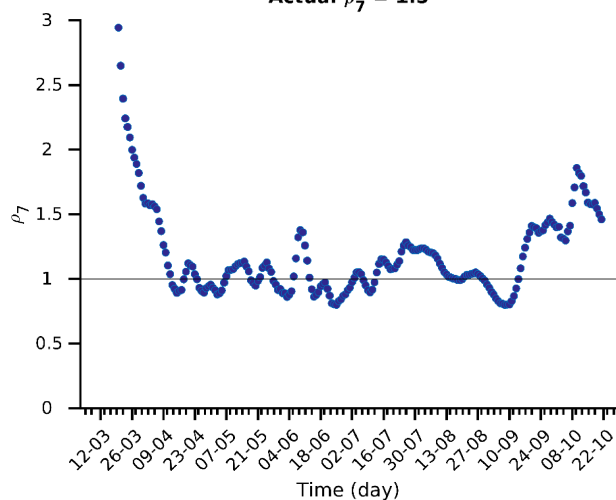
A <sub>14</sub>	EPG	CFR
272	398	6.81 %



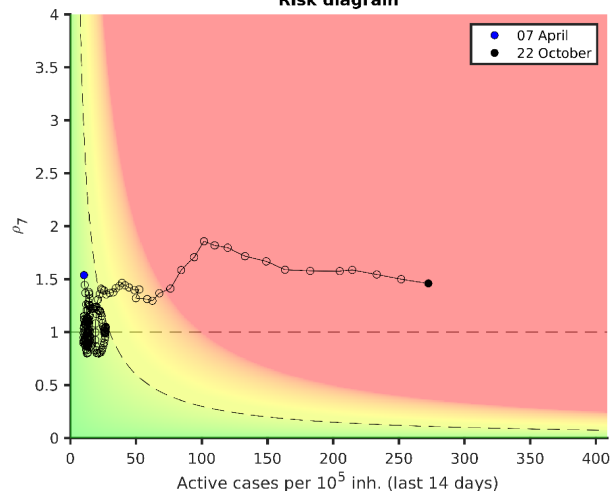
BIOCOM-Cov2 Degree = 9



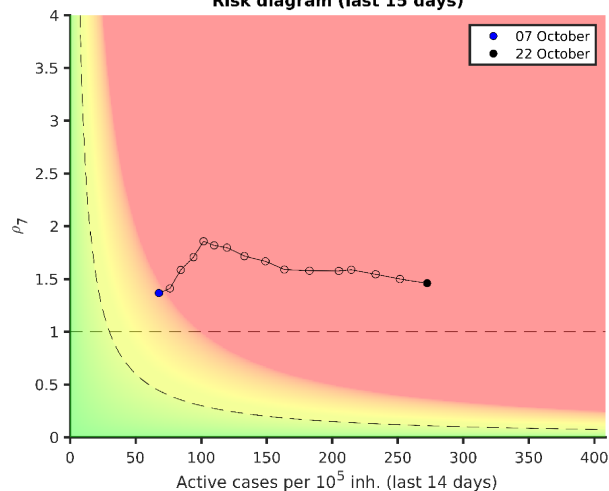
Actual  $\rho_7 = 1.5$



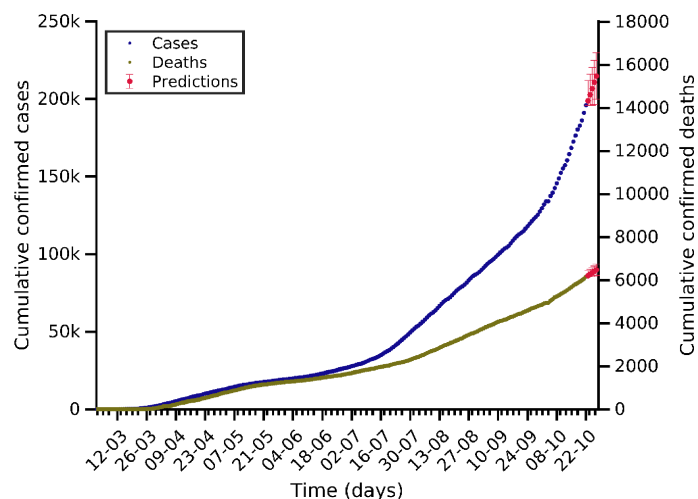
Risk diagram



Risk diagram (last 15 days)



# Romania 22-10-2020. Pop: 19.2M. Cumulative incidence: 1019/10<sup>5</sup>

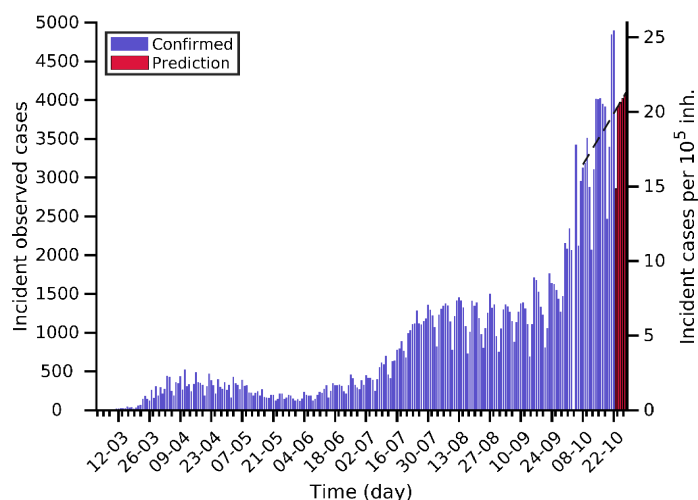


Predictions for next days

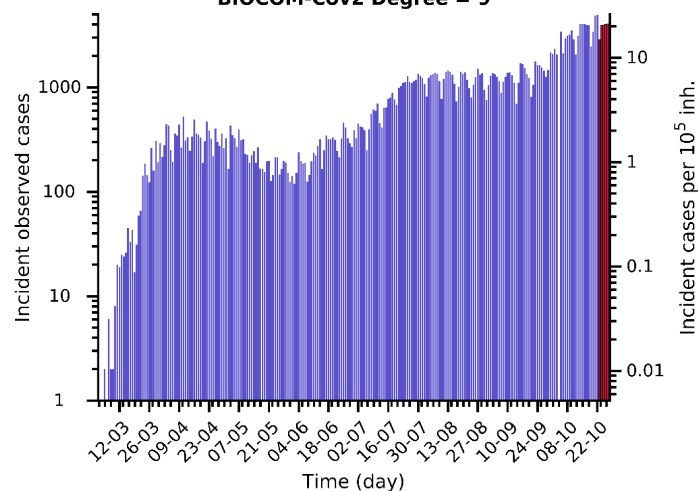
Day	Number of cases	95% Confidence Interval
23-10-2020	198859 (+2855)	[ 196004 - 211912 ]
25-10-2020	206755 (+3972)	[ 196004 - 220403 ]
27-10-2020	214841 (+4067)	[ 199848 - 229835 ]

Current indicators

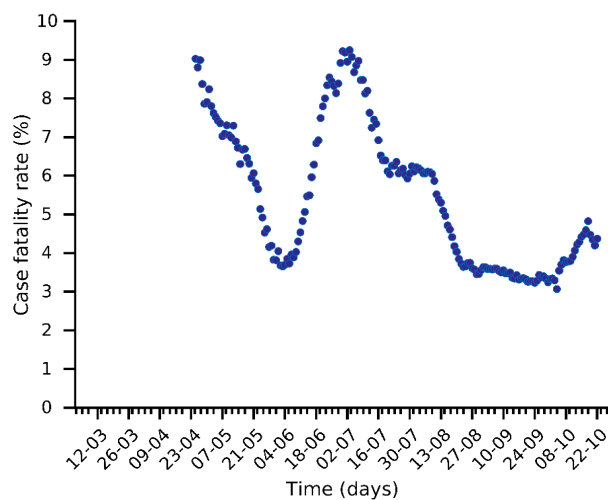
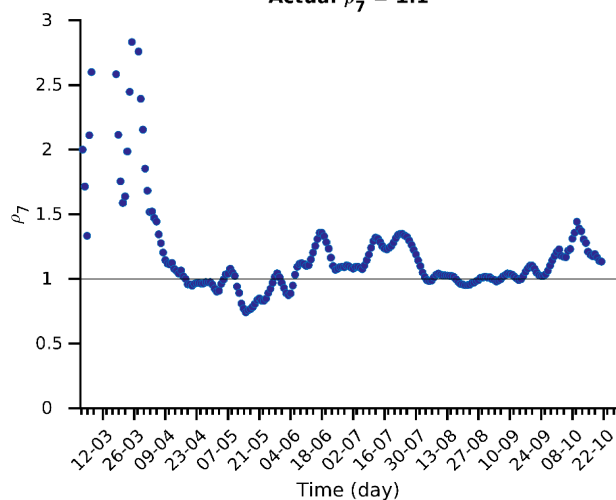
A <sub>14</sub>	EPG	CFR
261	297	4.37 %



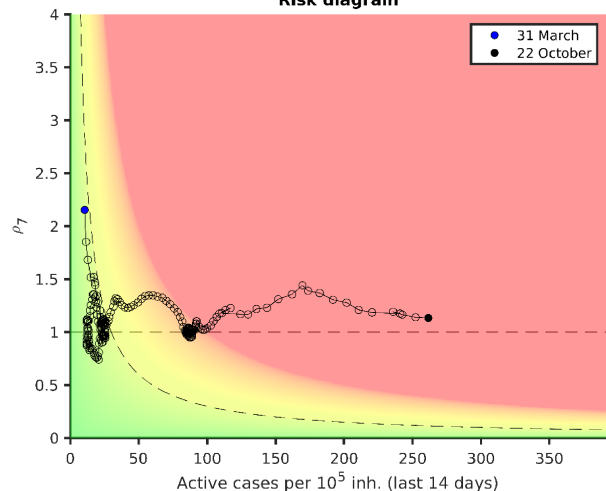
BIOCOM-Cov2 Degree = 9



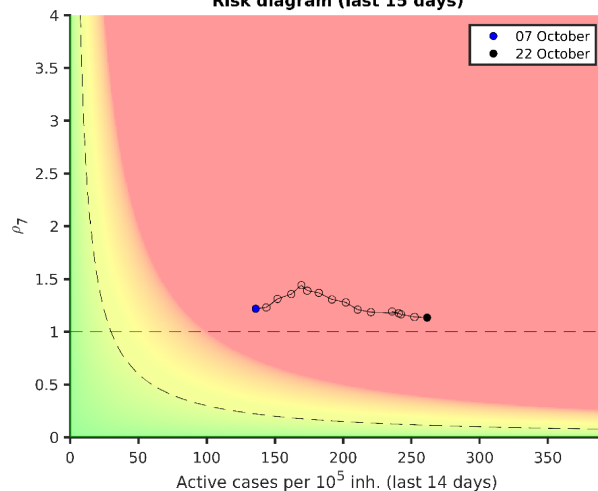
Actual  $\rho_7 = 1.1$



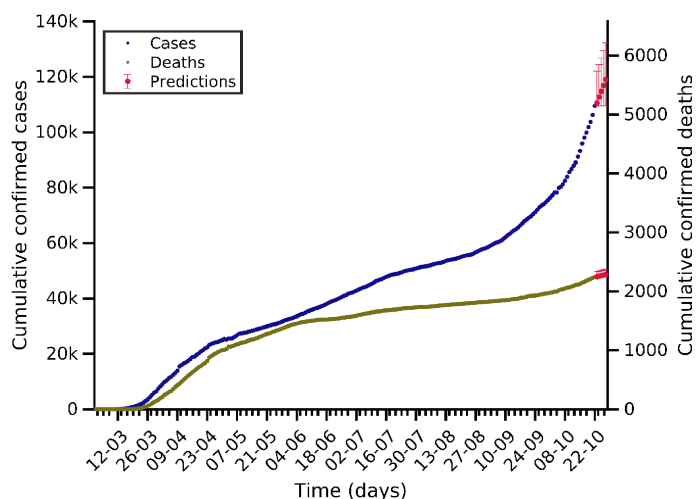
Risk diagram



Risk diagram (last 15 days)



# Portugal 22-10-2020. Pop: 10.2M. Cumulative incidence: 1074/10<sup>5</sup>

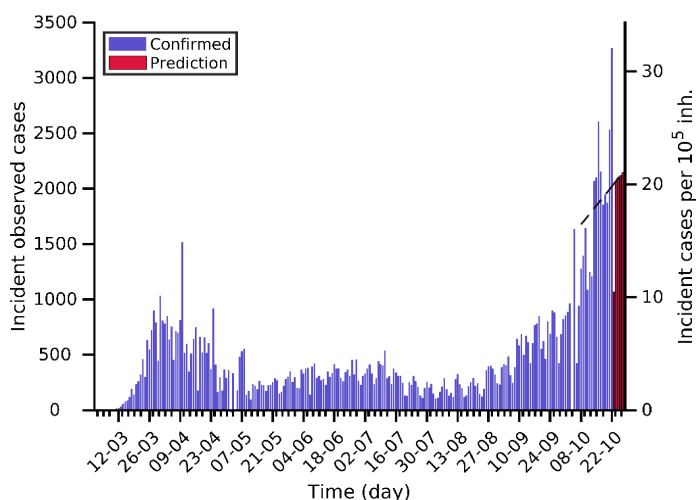


Predictions for next days

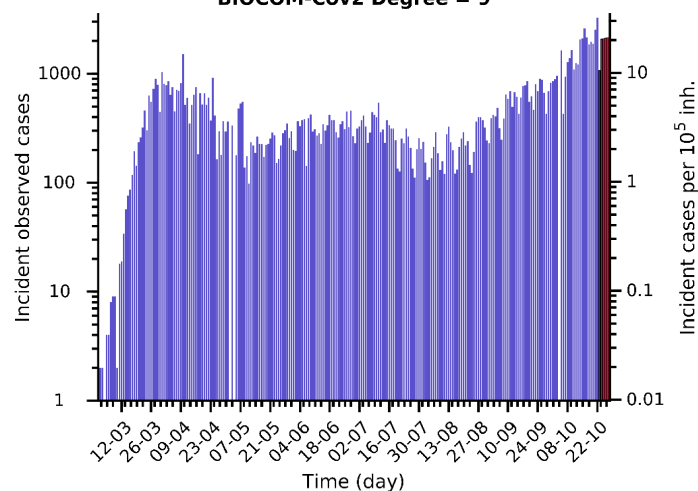
Day	Number of cases	95% Confidence Interval
23-10-2020	110608 (+1067)	[ 109541 - 122142 ]
25-10-2020	114775 (+2096)	[ 109541 - 126832 ]
27-10-2020	119043 (+2147)	[ 109541 - 132284 ]

Current indicators

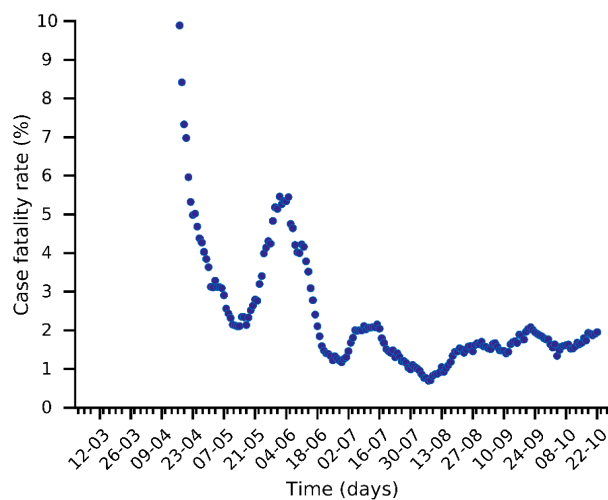
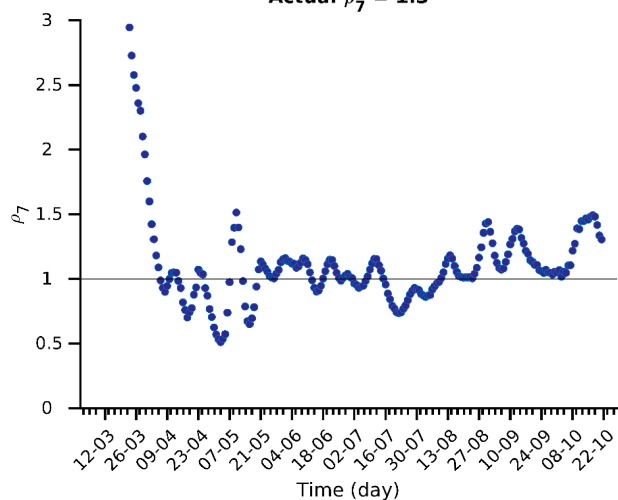
A <sub>14</sub>	EPG	CFR
265	346	1.95 %



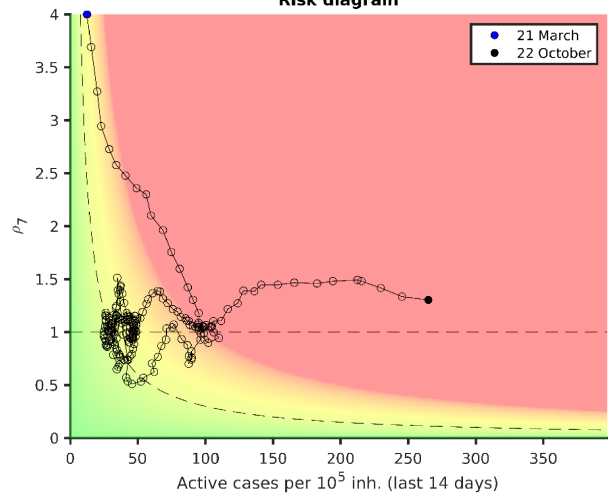
BIOCOM-Cov2 Degree = 9



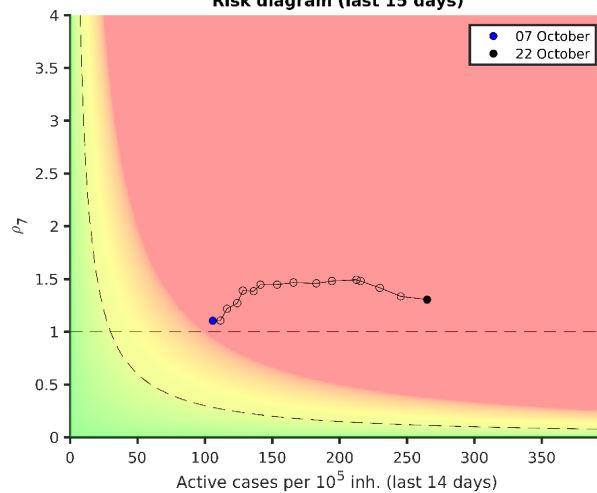
Actual  $\rho_7 = 1.3$



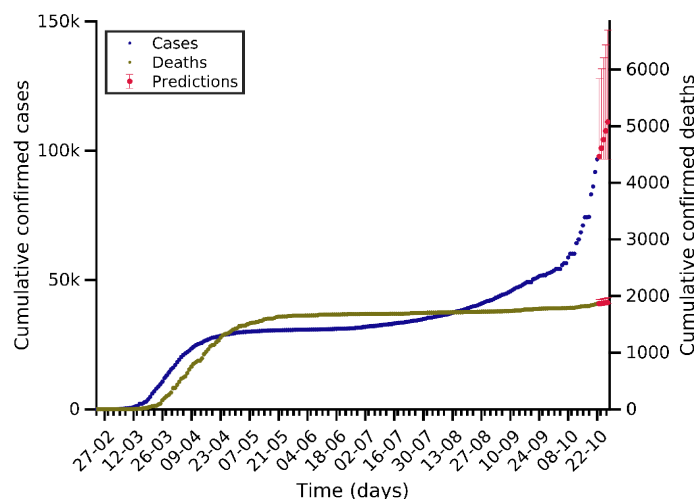
Risk diagram



Risk diagram (last 15 days)



# Switzerland 22-10-2020. Pop: 8.7M. Cumulative incidence: 1118/10<sup>5</sup>

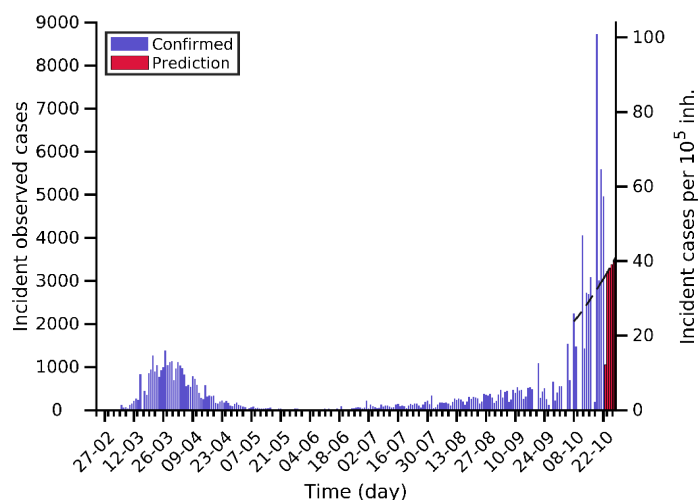


Predictions for next days

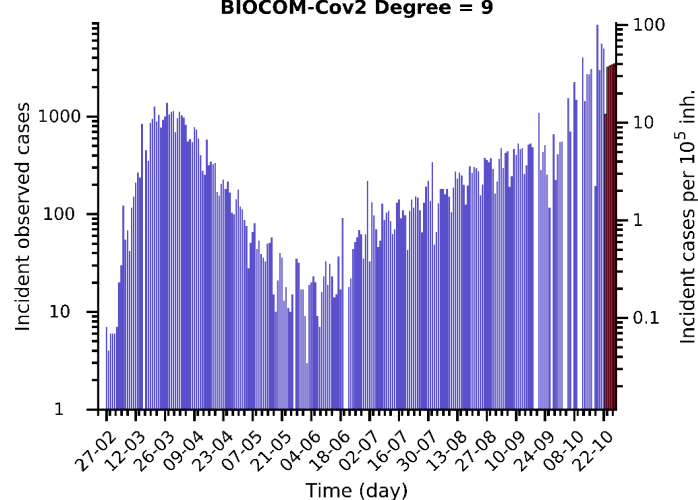
Day	Number of cases	95% Confidence Interval
23-10-2020	17058 (+94)	[ 16964 - 17643 ]
25-10-2020	17337 (+140)	[ 16964 - 17945 ]
27-10-2020	17618 (+140)	[ 16964 - 18277 ]

Current indicators

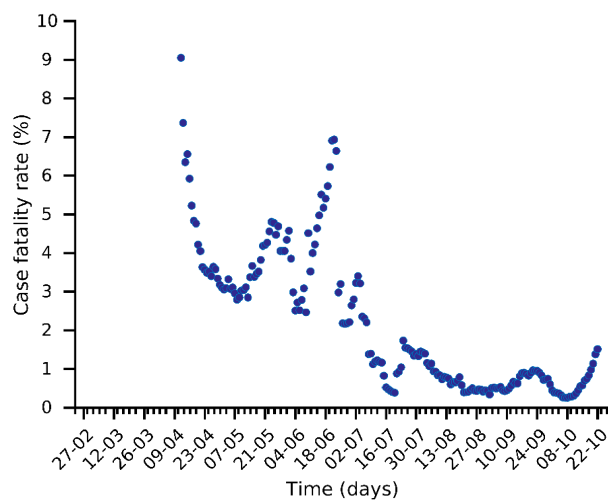
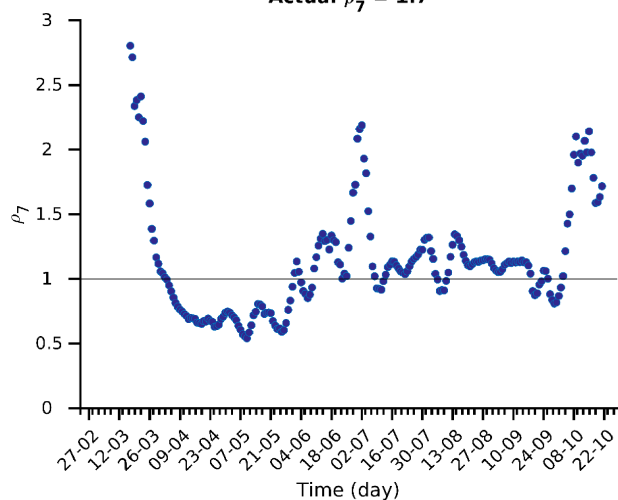
A <sub>14</sub>	EPG	CFR
36	38	0.26 %



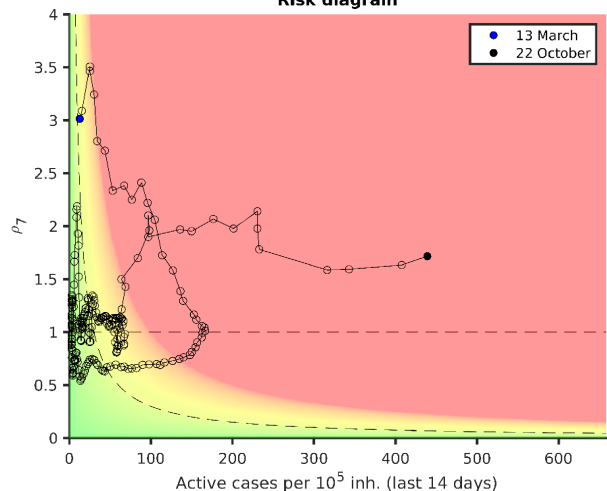
BIOCOM-Cov2 Degree = 9



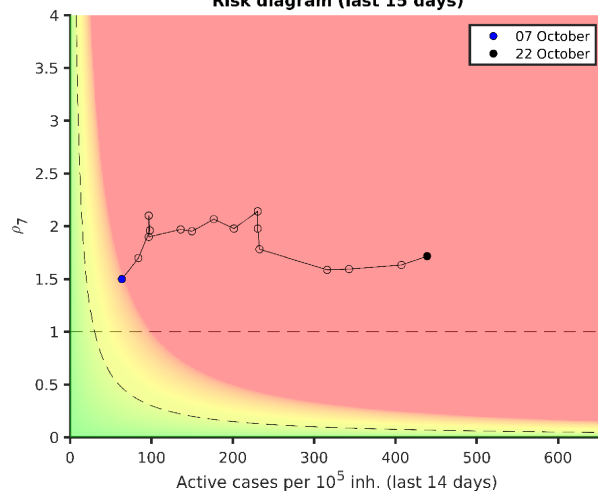
Actual  $\rho_7 = 1.7$



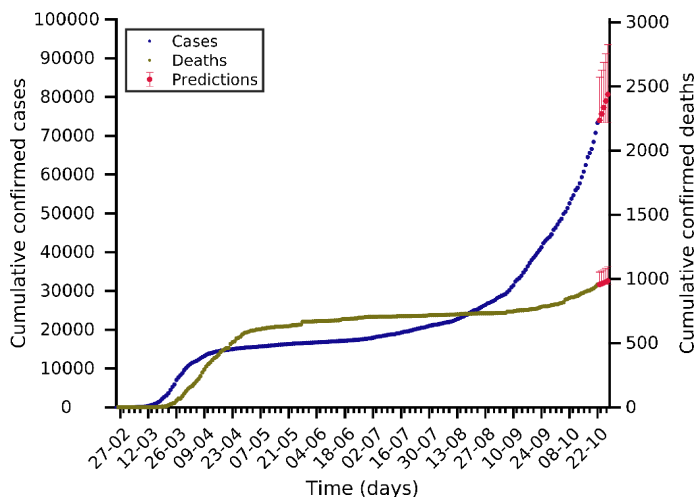
Risk diagram



Risk diagram (last 15 days)



# Austria 22-10-2020. Pop: 9.0M. Cumulative incidence: 814/10<sup>5</sup>

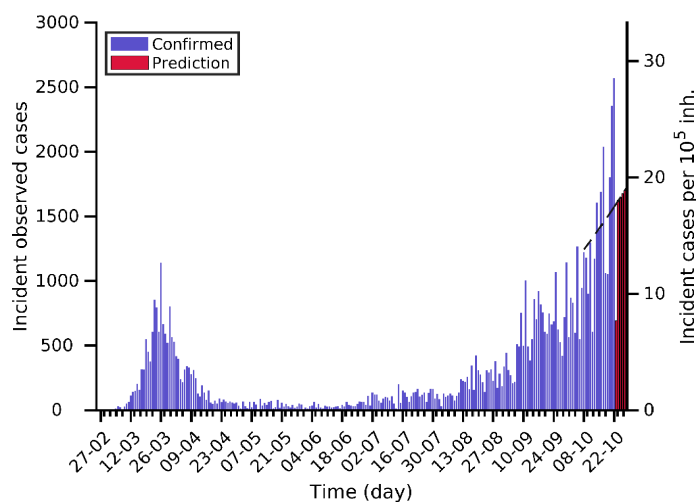


Predictions for next days

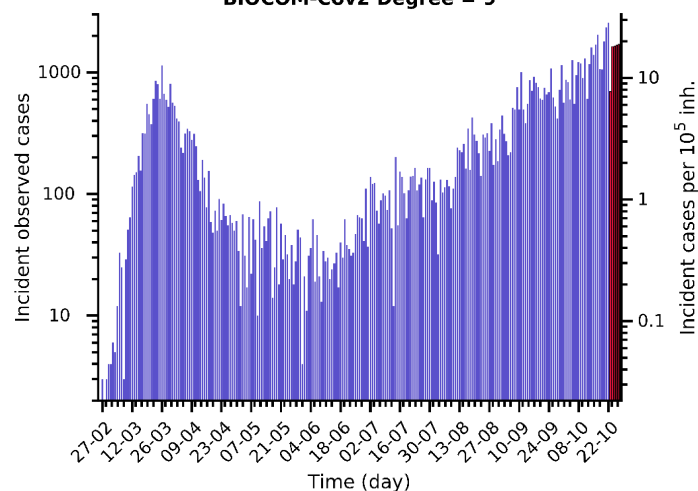
Day	Number of cases	95% Confidence Interval
23-10-2020	74032 (+693)	[ 73339 - 85158 ]
25-10-2020	77304 (+1649)	[ 73339 - 88953 ]
27-10-2020	80678 (+1700)	[ 73339 - 93528 ]

Current indicators

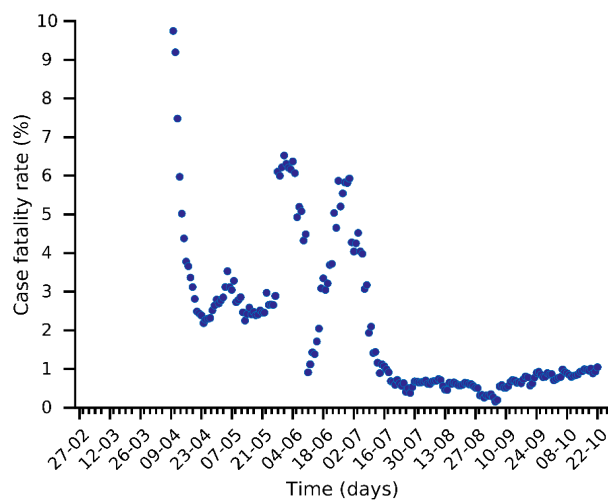
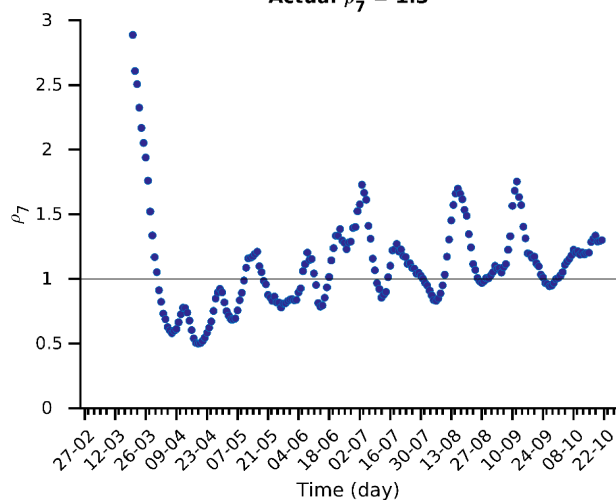
A <sub>14</sub>	EPG	CFR
230	299	1.05 %



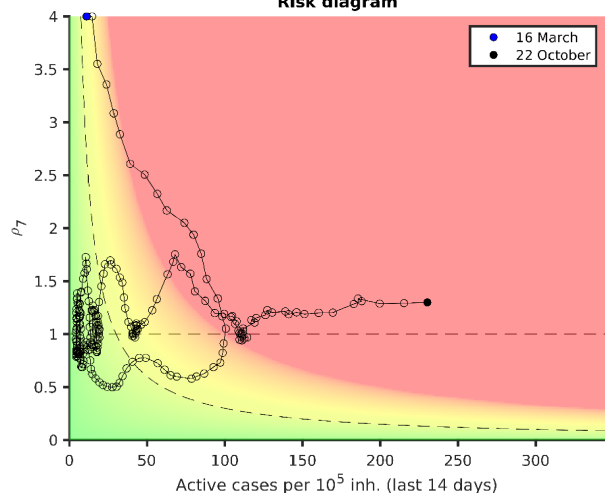
BIOCOM-Cov2 Degree = 9



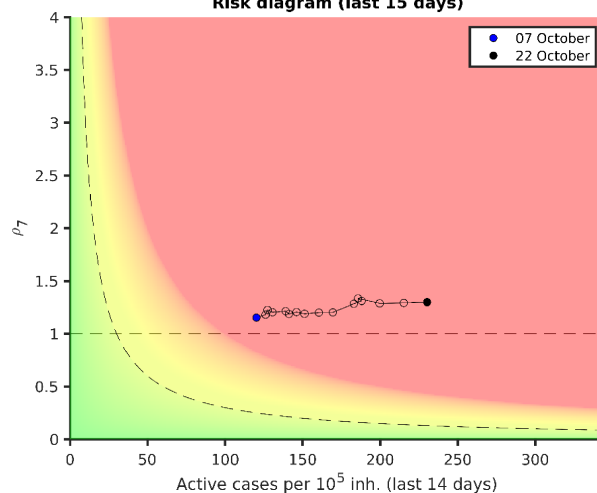
Actual  $\rho_7 = 1.3$



Risk diagram

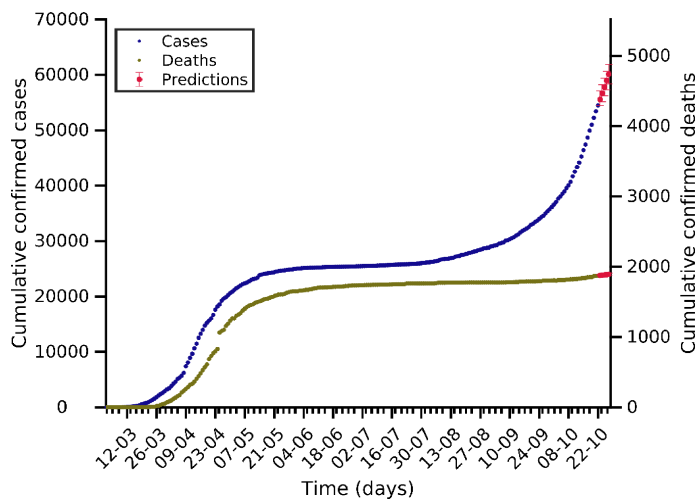


Risk diagram (last 15 days)





# Ireland 22-10-2020. Pop: 4.9M. Cumulative incidence: 1103/10<sup>5</sup>

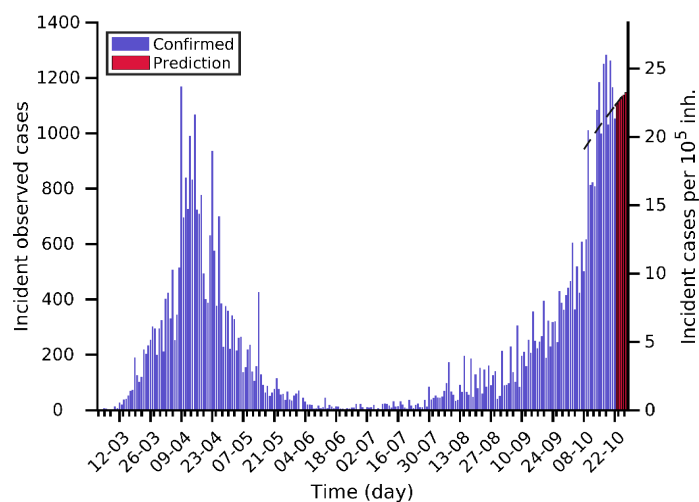


Predictions for next days

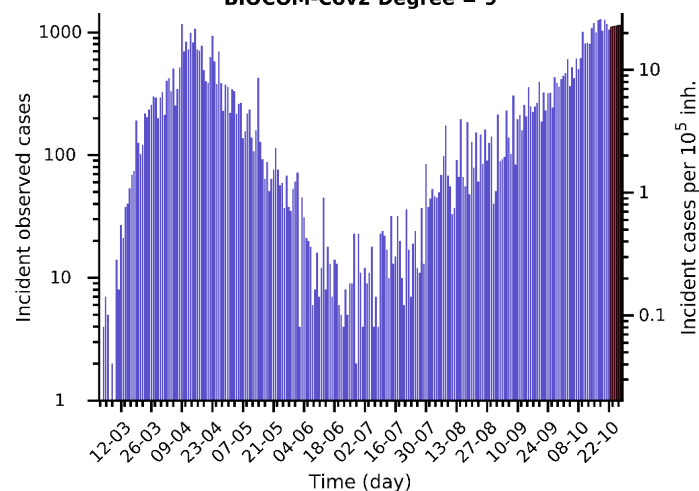
Day	Number of cases	95% Confidence Interval
23-10-2020	55582 (+1106)	[ 54476 - 57109 ]
25-10-2020	57830 (+1129)	[ 56235 - 59426 ]
27-10-2020	60118 (+1148)	[ 58370 - 61866 ]

Current indicators

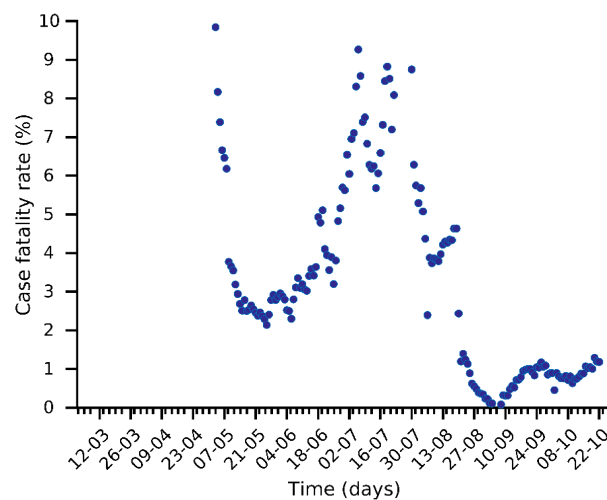
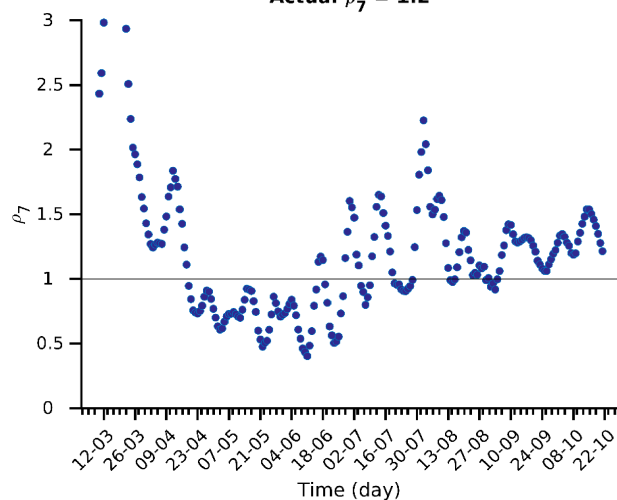
A <sub>14</sub>	EPG	CFR
291	354	1.18 %



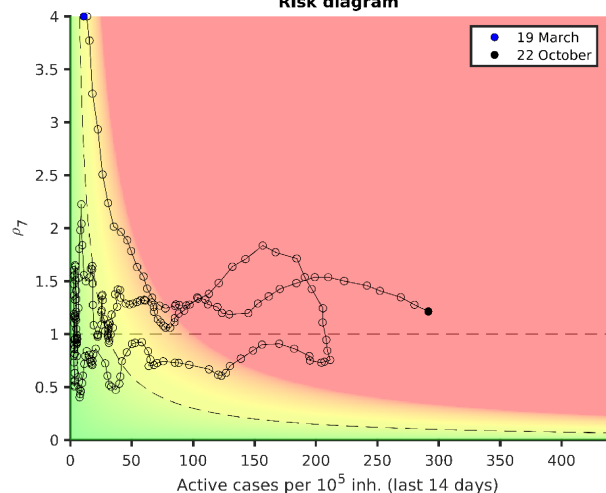
BIOCOM-Cov2 Degree = 9



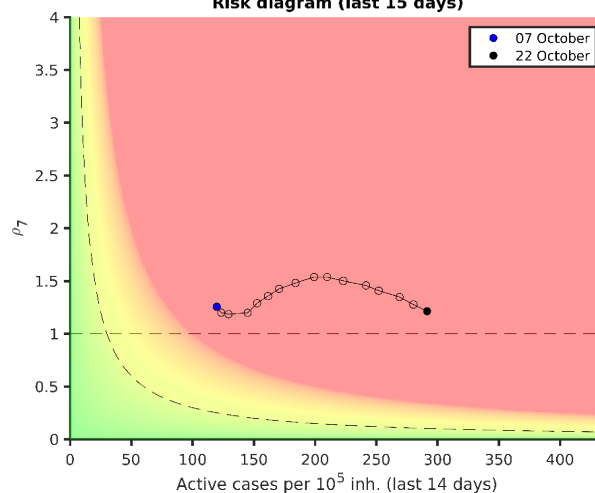
Actual  $\rho_7 = 1.2$



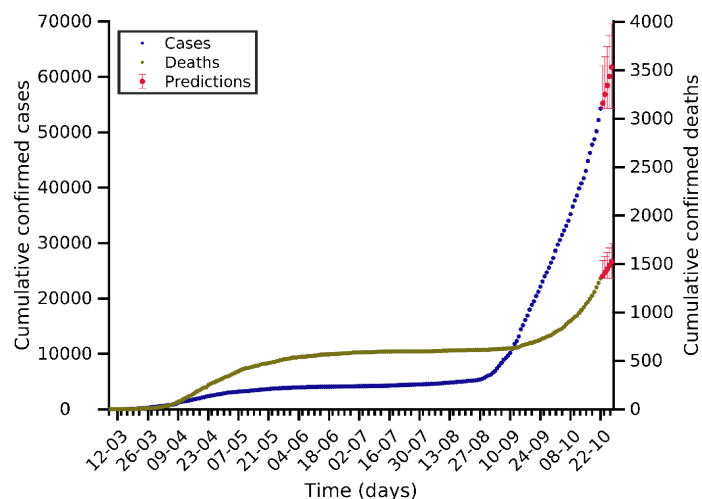
Risk diagram



Risk diagram (last 15 days)



# Hungary 22-10-2020. Pop: 9.7M. Cumulative incidence: 562/10<sup>5</sup>

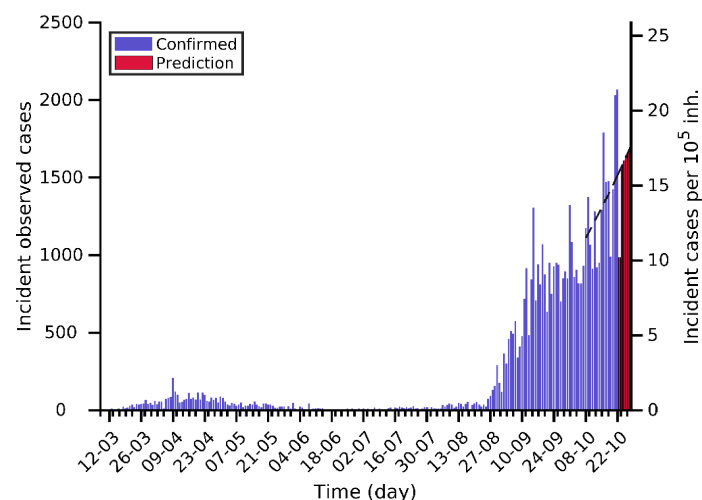


Predictions for next days

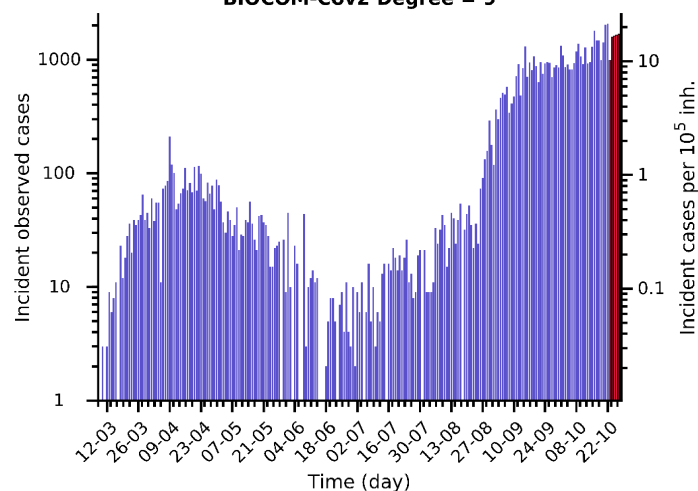
Day	Number of cases	95% Confidence Interval
23-10-2020	55263 (+985)	[ 54278 - 61944 ]
25-10-2020	58447 (+1608)	[ 54278 - 65461 ]
27-10-2020	61759 (+1672)	[ 54278 - 69552 ]

Current indicators

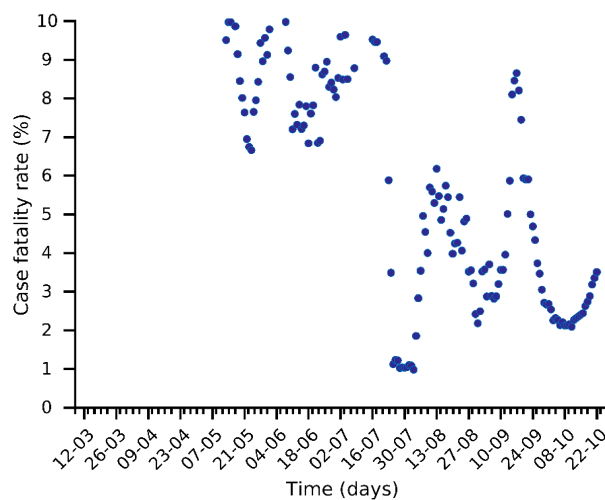
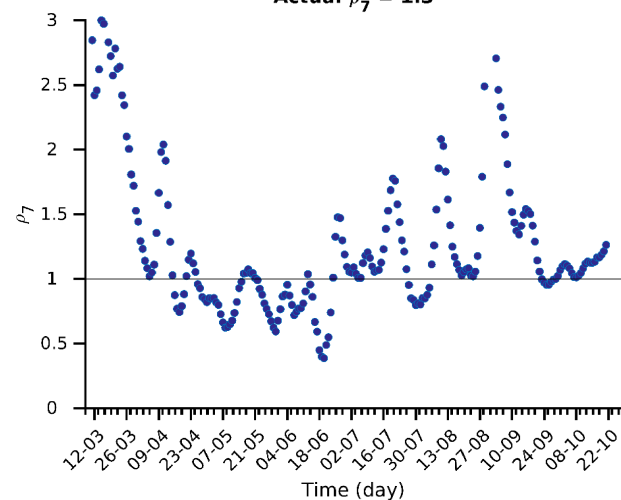
A <sub>14</sub>	EPG	CFR
197	249	3.51 %



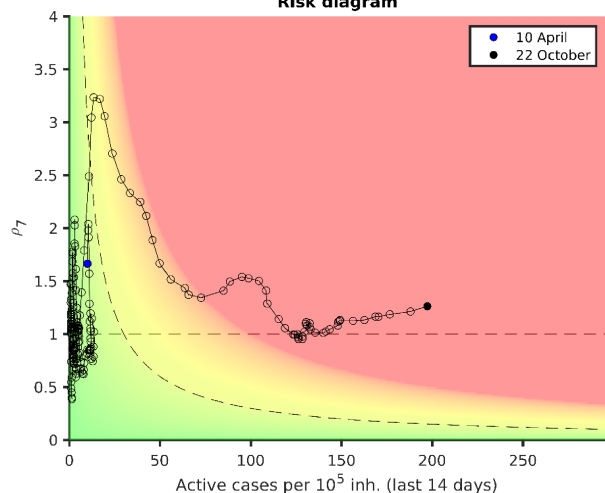
BIOCOM-Cov2 Degree = 9



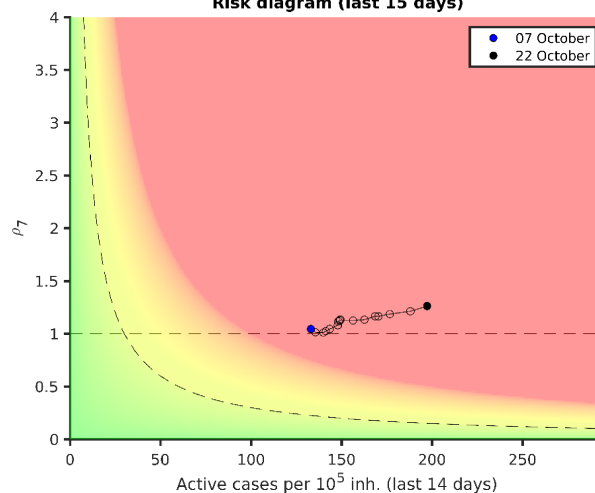
Actual  $\rho_7 = 1.3$



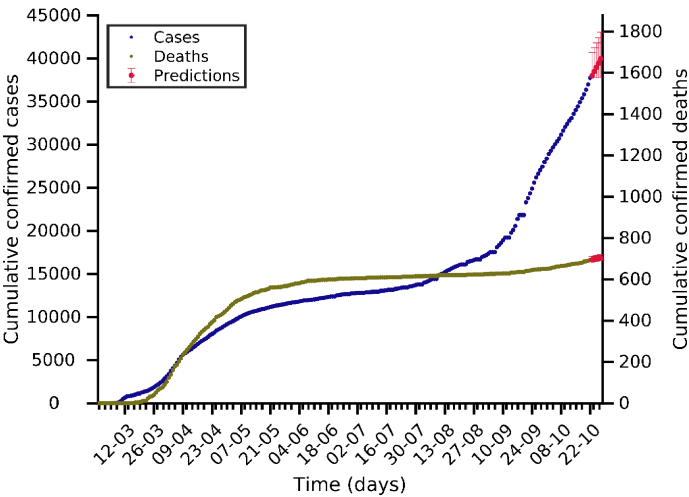
Risk diagram



Risk diagram (last 15 days)

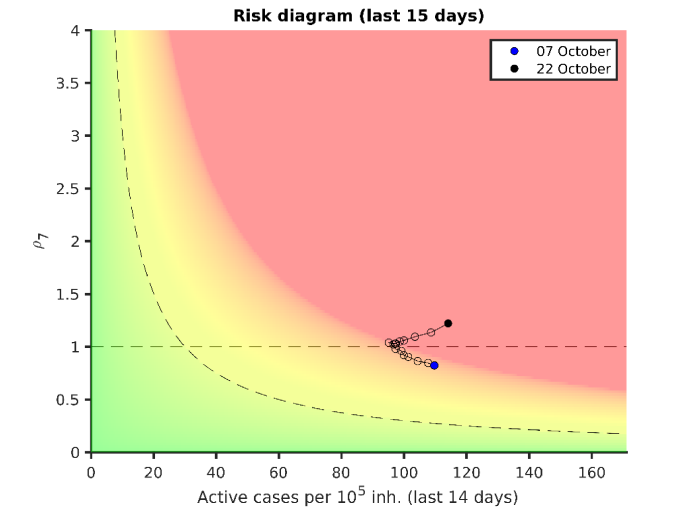
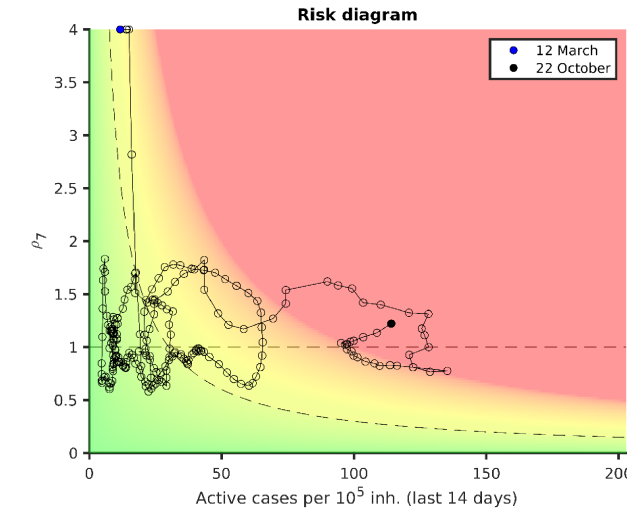
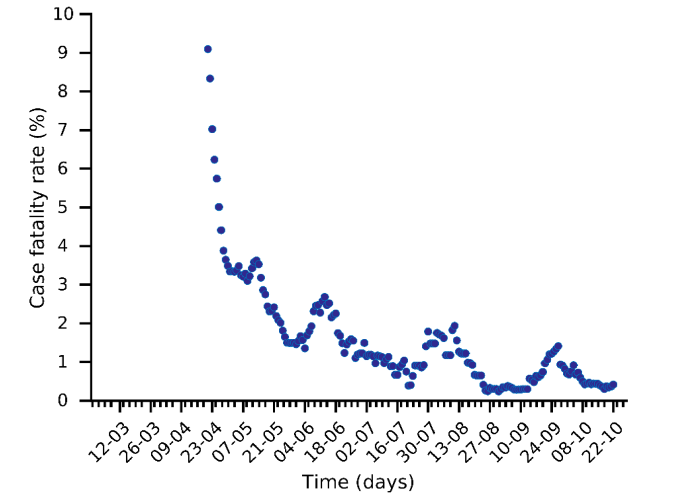
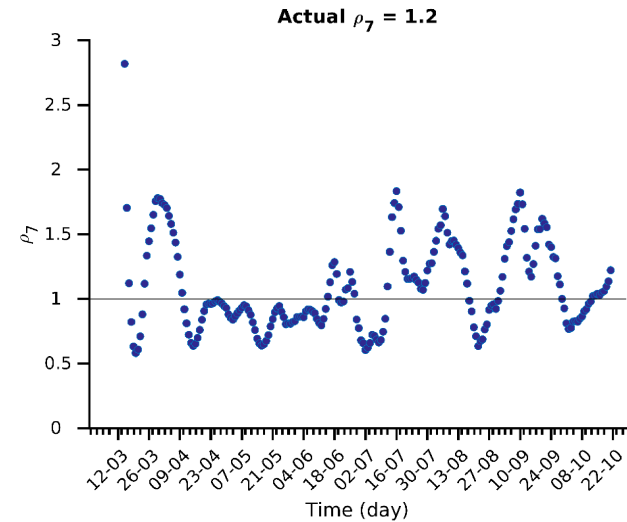
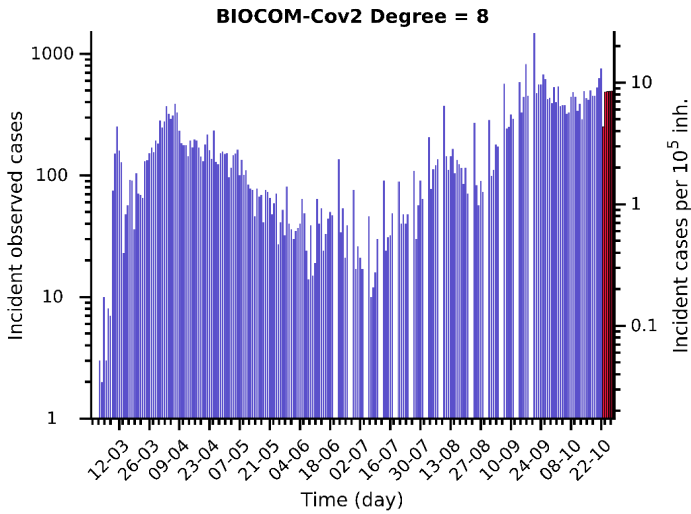
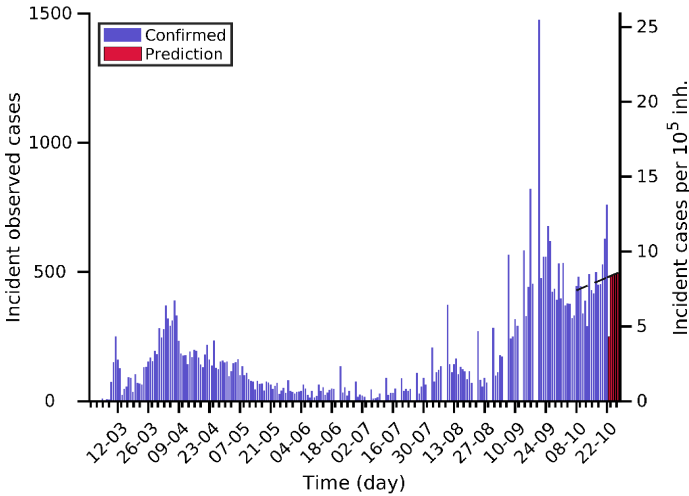


Denmark 22-10-2020. Pop: 5.8M. Cumulative incidence: 652/10<sup>5</sup>

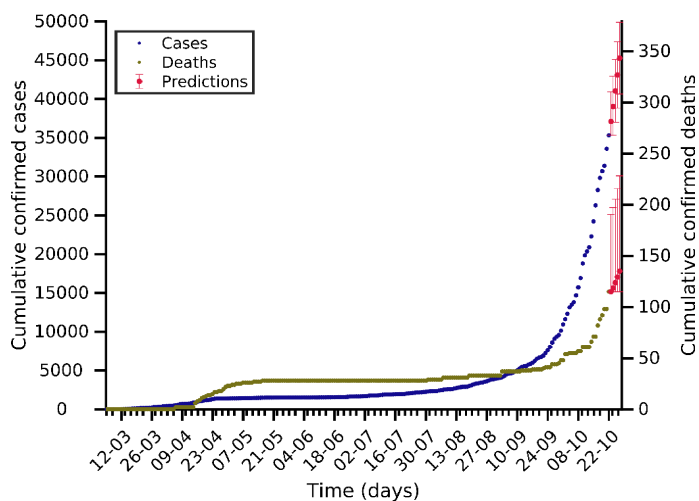


Predictions for next days		
Day	Number of cases	95% Confidence Interval
23-10-2020	38014 (+251)	[ 37763 - 40719 ]
25-10-2020	38988 (+489)	[ 37763 - 41809 ]
27-10-2020	39977 (+496)	[ 37763 - 43054 ]

Current indicators		
A <sub>14</sub>	EPG	CFR
114	139	0.41 %



# Slovakia 22-10-2020. Pop: 5.5M. Cumulative incidence: 647/10<sup>5</sup>

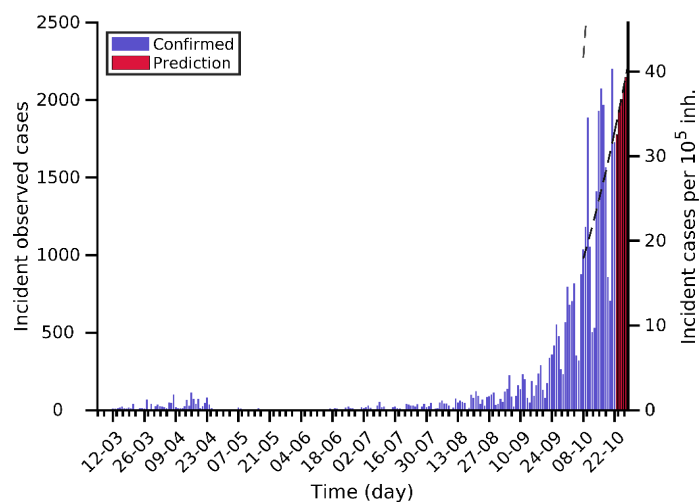


Predictions for next days

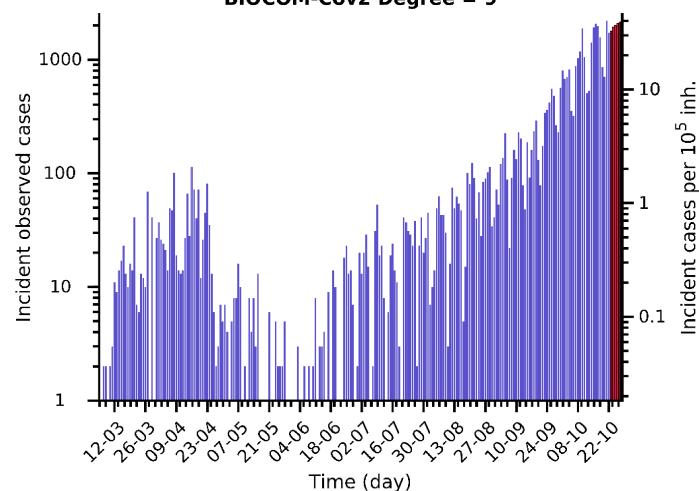
Day	Number of cases	95% Confidence Interval
23-10-2020	37107 (+1777)	[ 35330 - 40926 ]
25-10-2020	41045 (+2005)	[ 36995 - 45096 ]
27-10-2020	45270 (+2149)	[ 40639 - 49901 ]

Current indicators

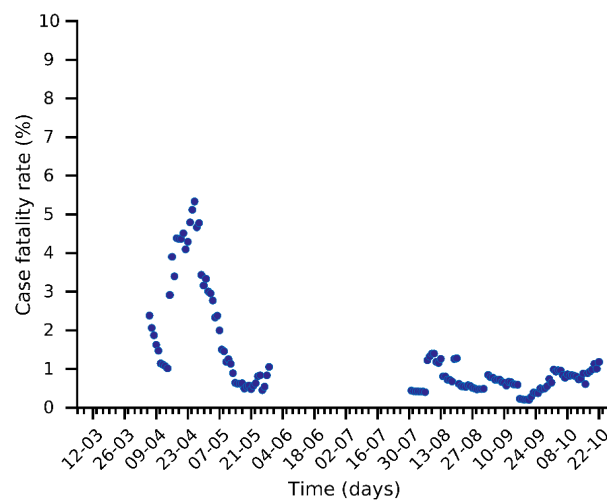
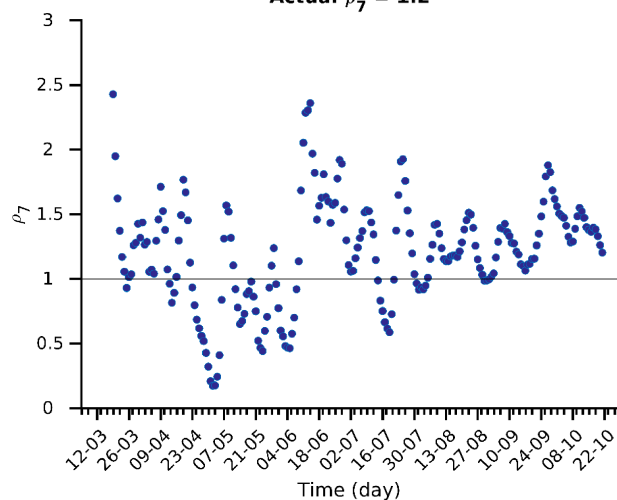
A <sub>14</sub>	EPG	CFR
359	432	1.18 %



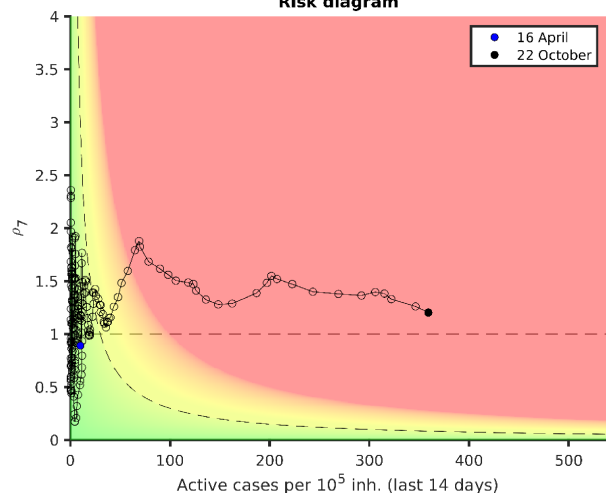
BIOCOM-Cov2 Degree = 9



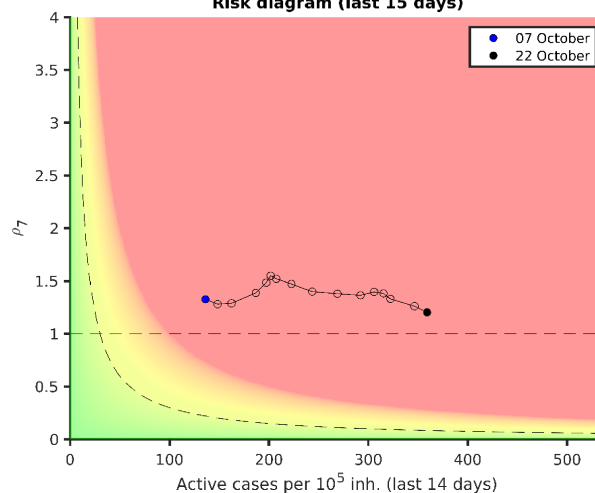
Actual  $\rho_7 = 1.2$



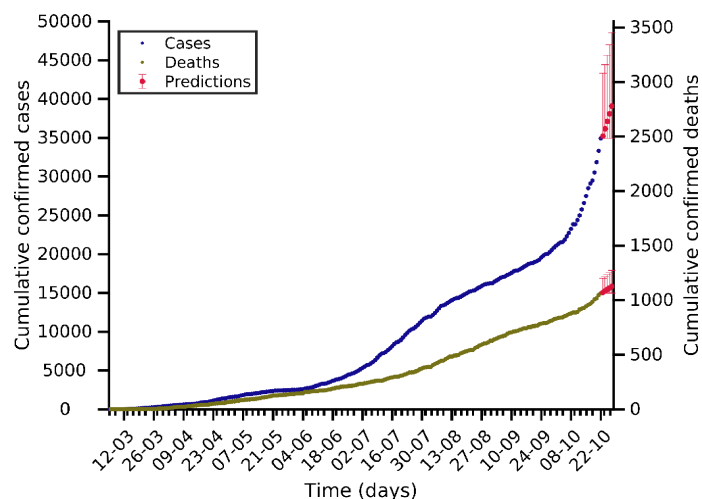
Risk diagram



Risk diagram (last 15 days)



# Bulgaria 22-10-2020. Pop: 6.9M. Cumulative incidence: 503/10<sup>5</sup>

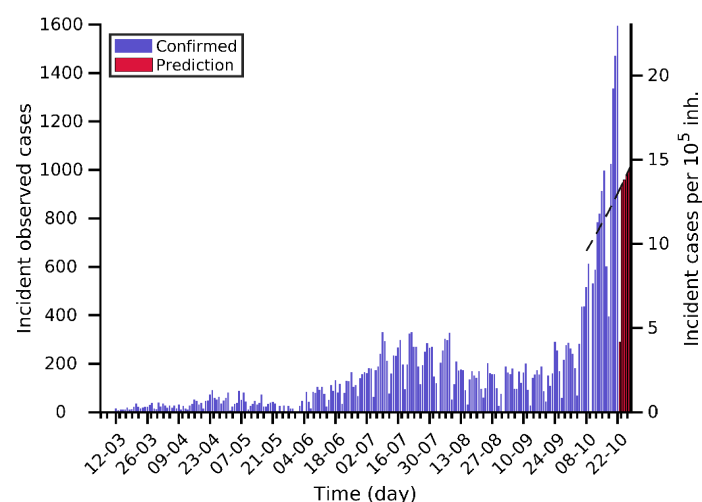


Predictions for next days

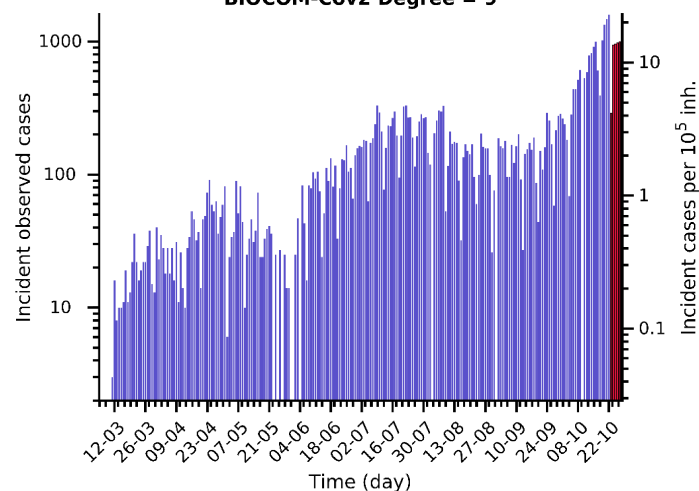
Day	Number of cases	95% Confidence Interval
23-10-2020	35220 (+290)	[ 34930 - 43334 ]
25-10-2020	37119 (+959)	[ 34930 - 45635 ]
27-10-2020	39096 (+998)	[ 34930 - 48551 ]

Current indicators

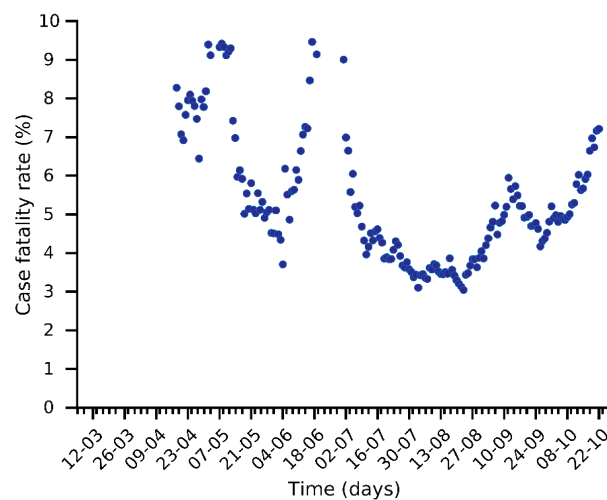
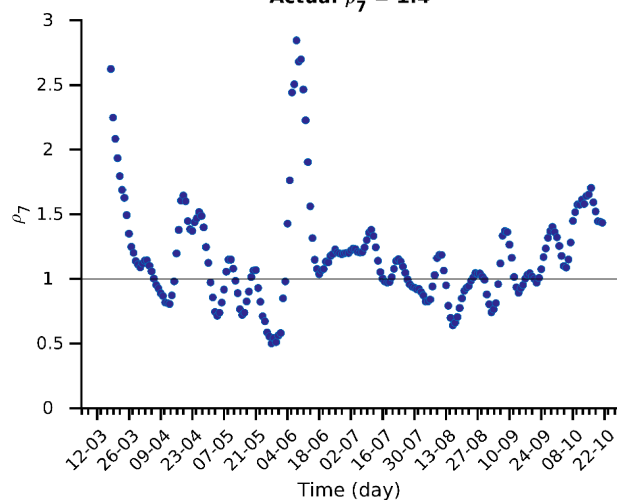
A <sub>14</sub>	EPG	CFR
168	241	7.21 %



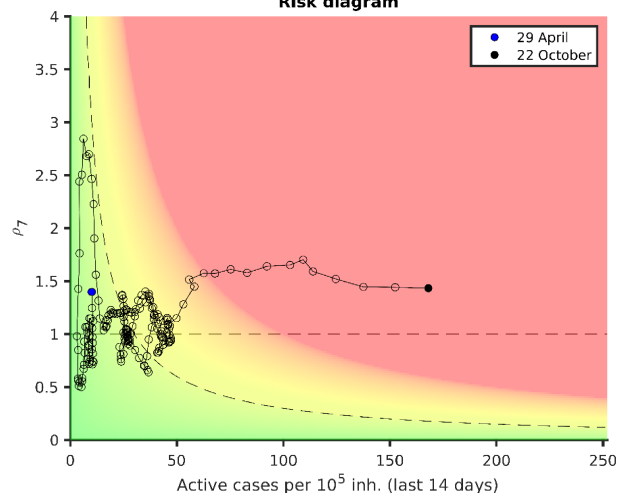
BIOCOM-Cov2 Degree = 9



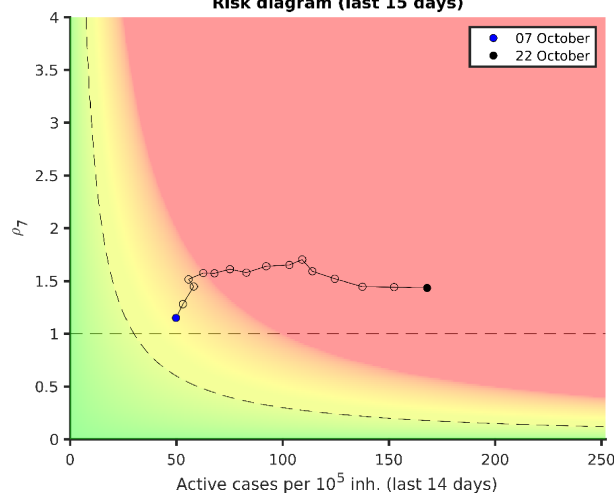
Actual  $\rho_7 = 1.4$



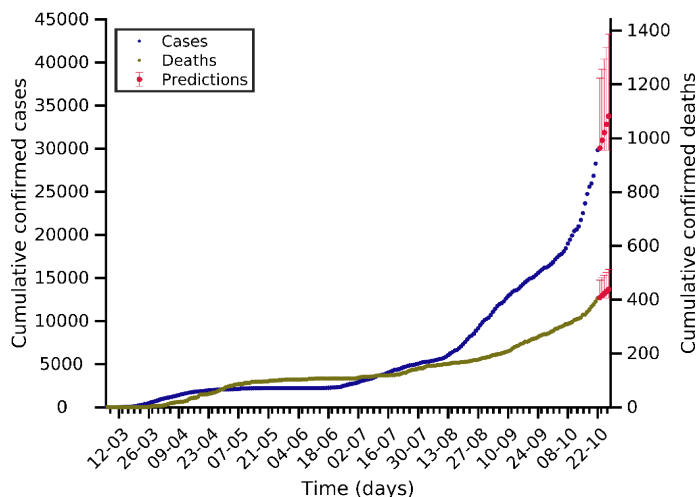
Risk diagram



Risk diagram (last 15 days)



# Croatia 22-10-2020. Pop: 4.1M. Cumulative incidence: 727/10<sup>5</sup>

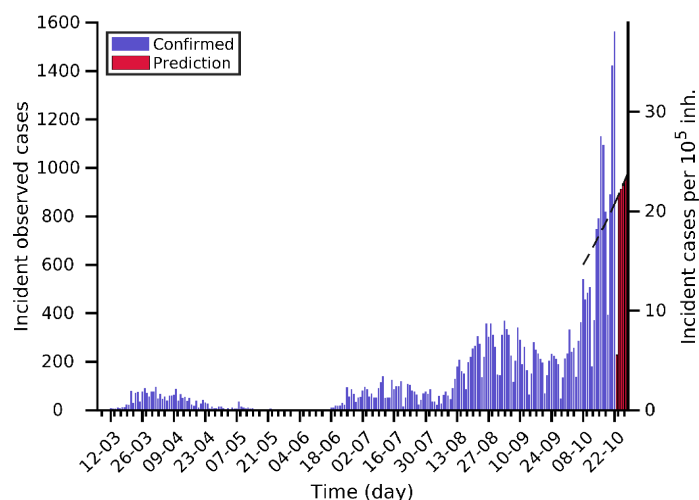


Predictions for next days

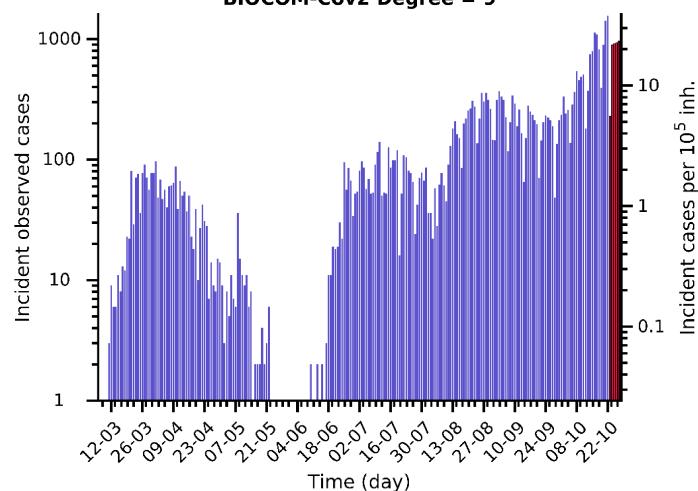
Day	Number of cases	95% Confidence Interval
23-10-2020	30078 (+228)	[ 29850 - 38207 ]
25-10-2020	31884 (+913)	[ 29850 - 40428 ]
27-10-2020	33775 (+956)	[ 29850 - 43303 ]

Current indicators

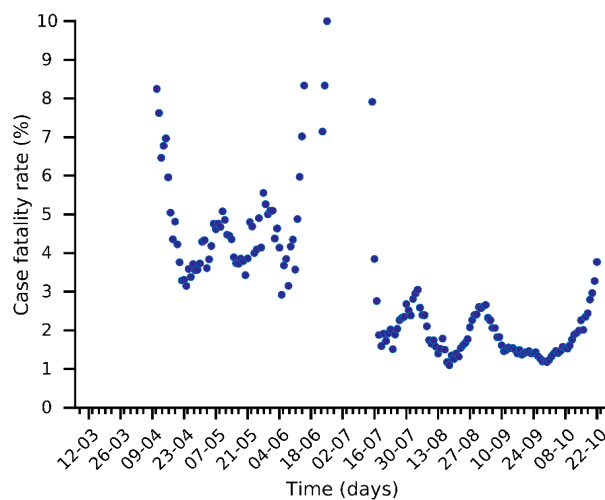
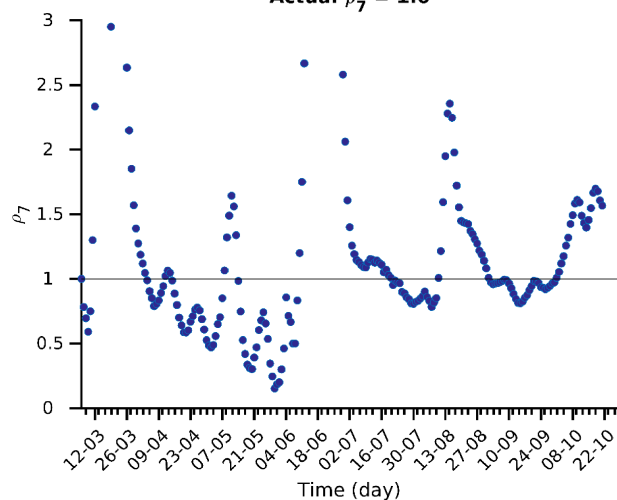
A <sub>14</sub>	EPG	CFR
265	415	3.77 %



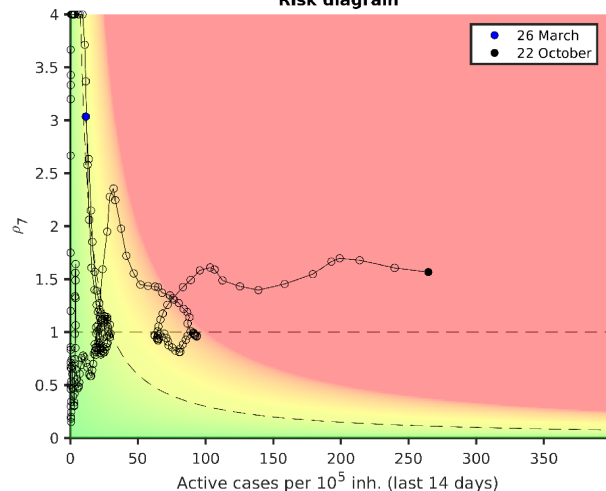
BIOCOM-Cov2 Degree = 9



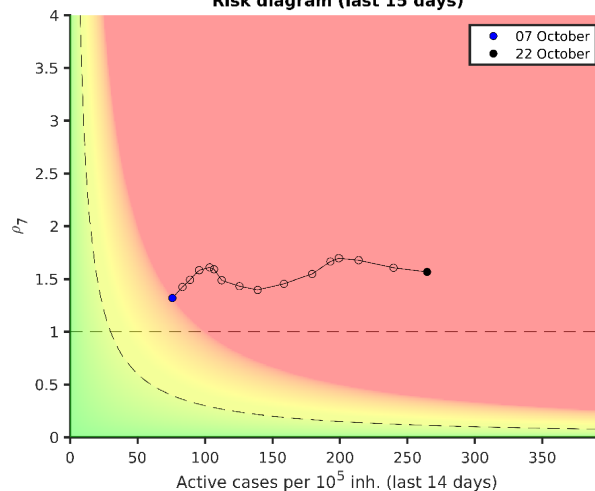
Actual  $\rho_7 = 1.6$



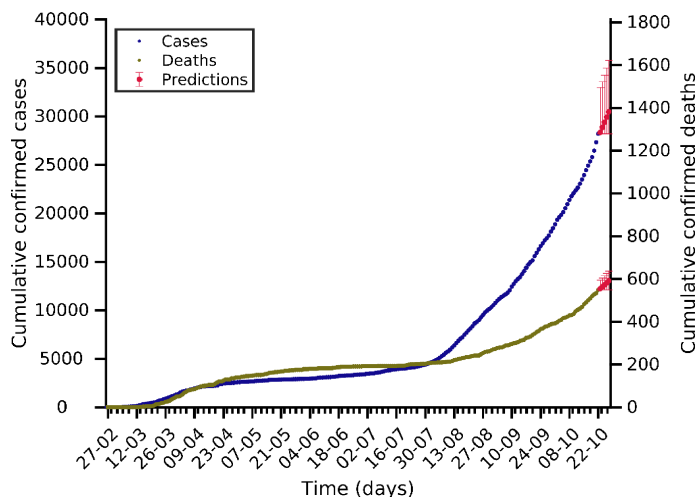
Risk diagram



Risk diagram (last 15 days)



# Greece 22-10-2020. Pop: 10.4M. Cumulative incidence: 271/10<sup>5</sup>

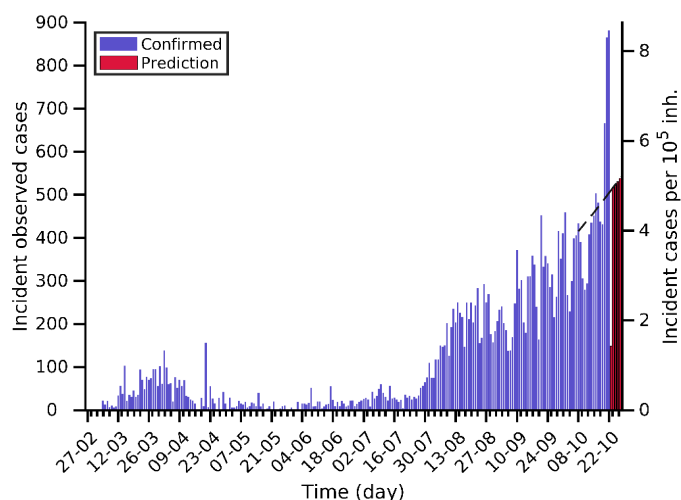


Predictions for next days

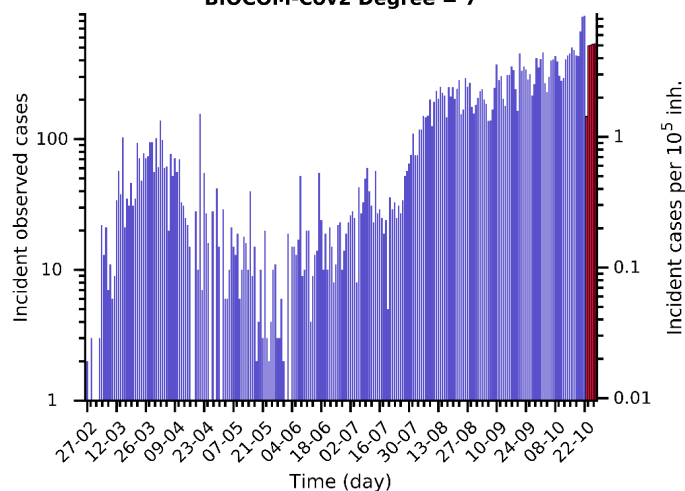
Day	Number of cases	95% Confidence Interval
23-10-2020	28365 (+149)	[ 28216 - 32989 ]
25-10-2020	29407 (+524)	[ 28216 - 34242 ]
27-10-2020	30476 (+538)	[ 28216 - 35788 ]

Current indicators

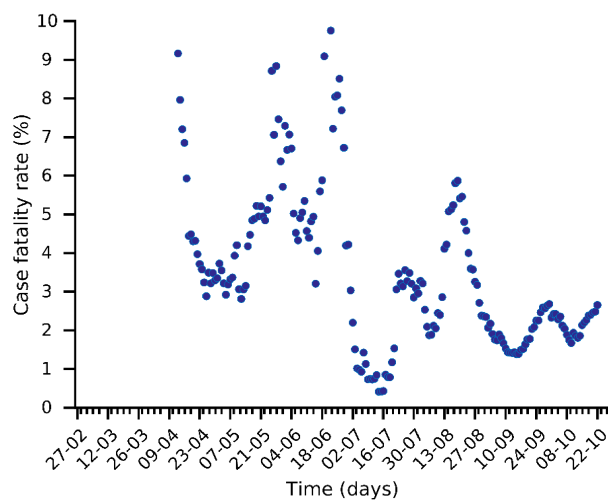
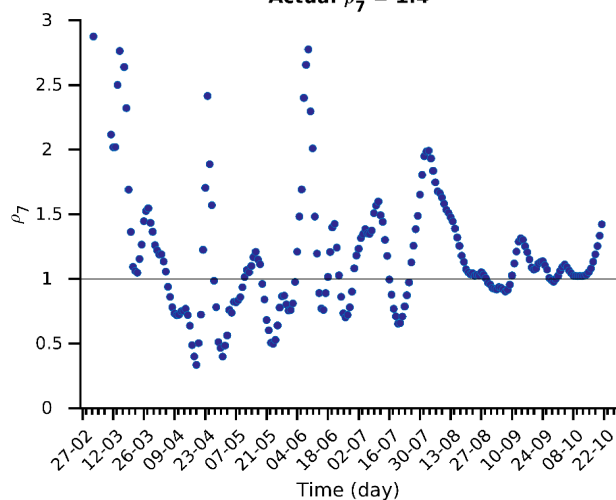
A <sub>14</sub>	EPG	CFR
66	93	2.65 %



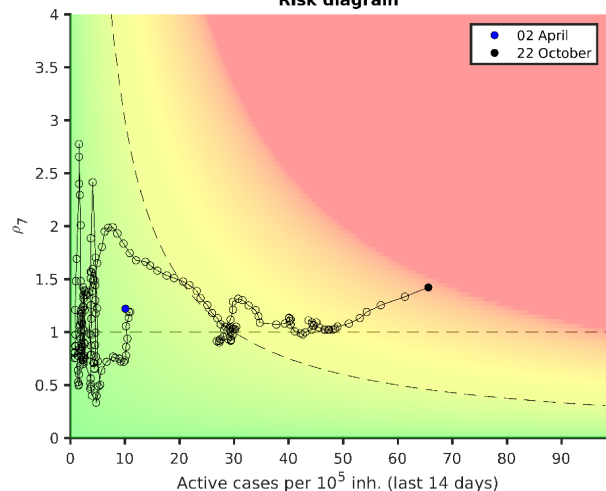
BIOCOM-Cov2 Degree = 7



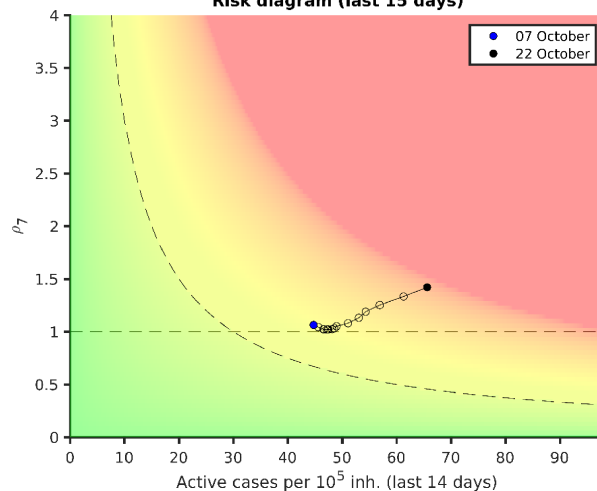
Actual  $\rho_7 = 1.4$



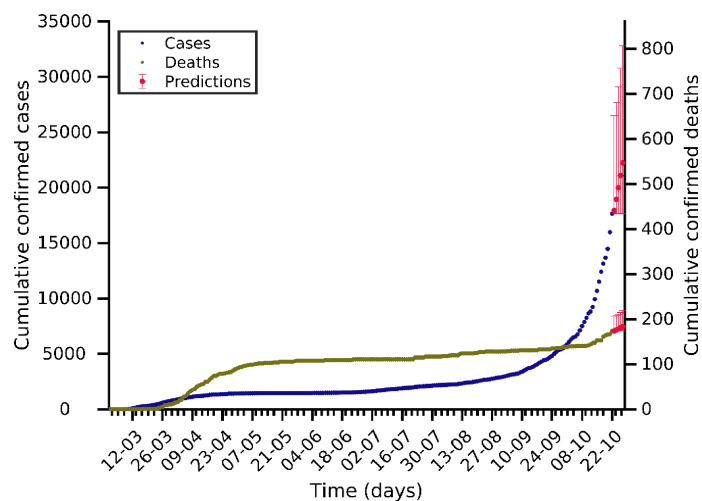
Risk diagram



Risk diagram (last 15 days)



# Slovenia 22-10-2020. Pop: 2.1M. Cumulative incidence: 849/10<sup>5</sup>

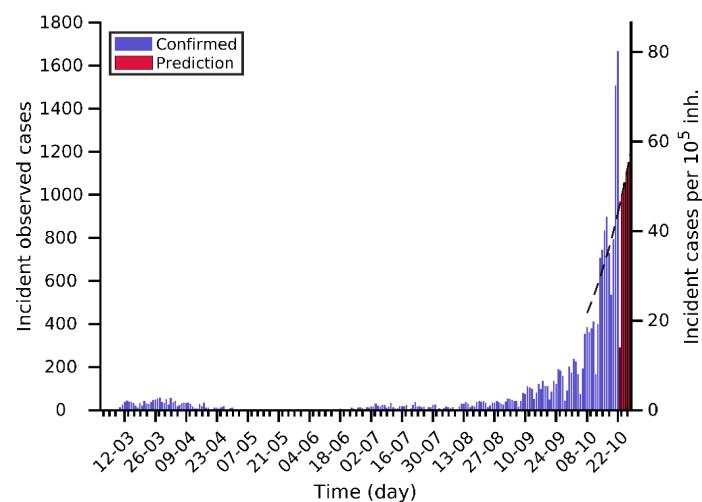


Predictions for next days

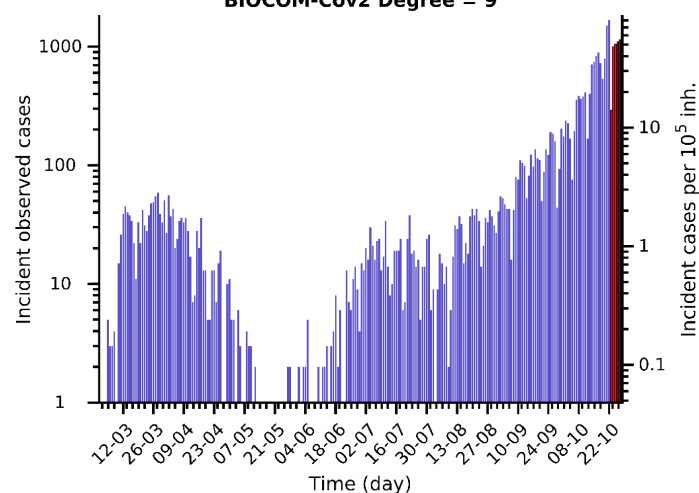
Day	Number of cases	95% Confidence Interval
23-10-2020	17942 (+291)	[ 17651 - 26487 ]
25-10-2020	19997 (+1051)	[ 17651 - 29100 ]
27-10-2020	22249 (+1152)	[ 17651 - 32802 ]

Current indicators

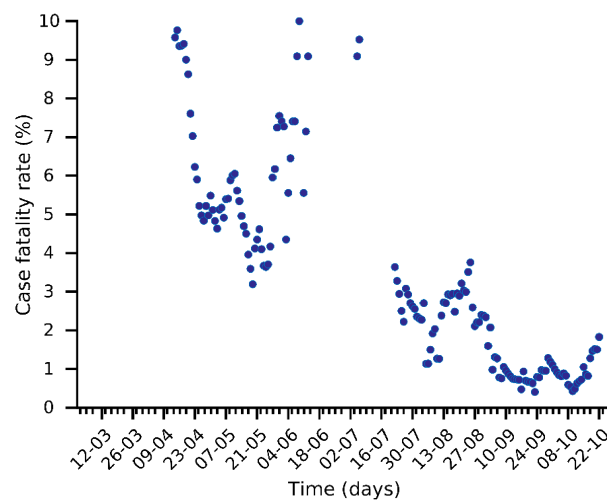
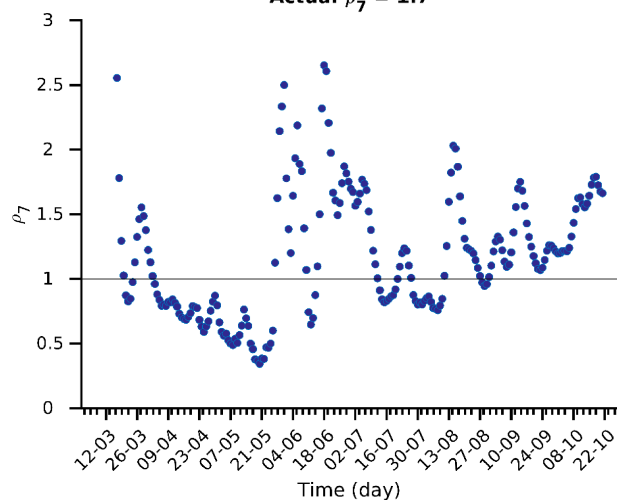
A <sub>14</sub>	EPG	CFR
488	811	1.83 %



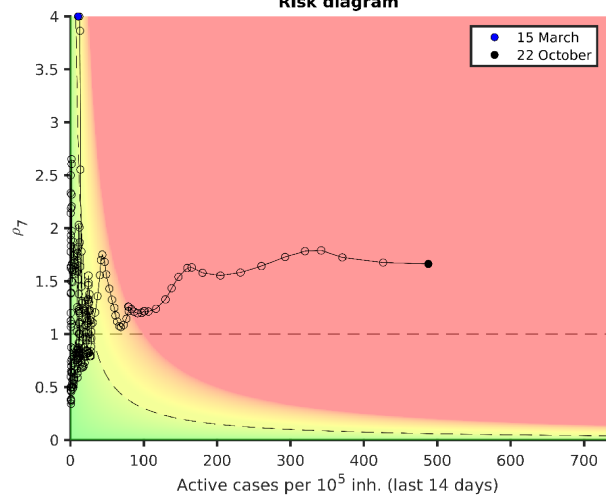
BIOCOM-Cov2 Degree = 9



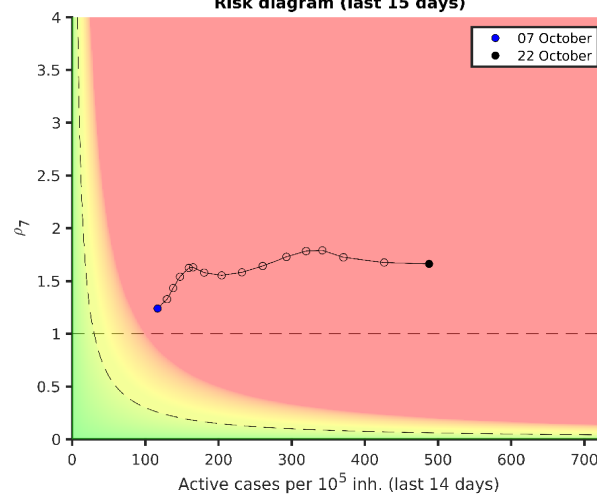
Actual  $\rho_7 = 1.7$



Risk diagram

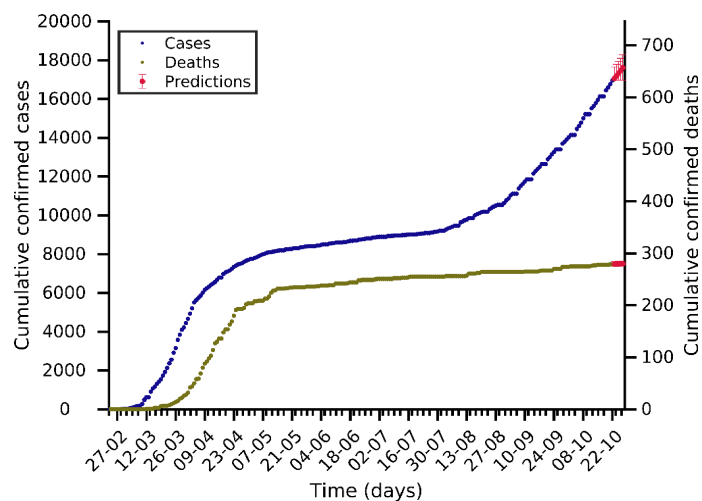


Risk diagram (last 15 days)





# Norway 22-10-2020. Pop: 5.4M. Cumulative incidence: 313/10<sup>5</sup>

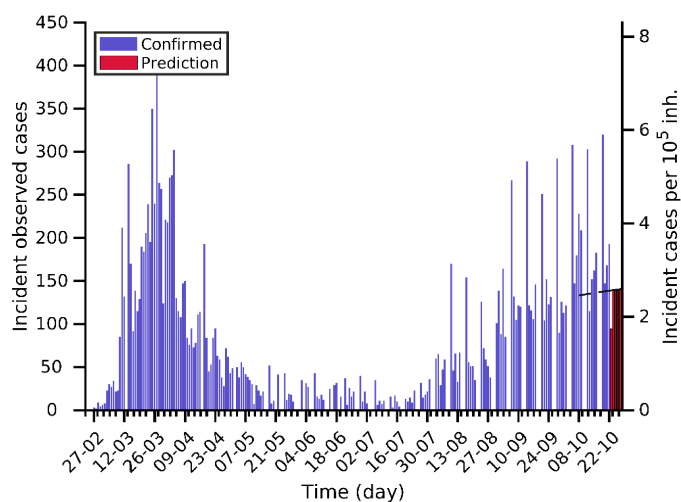


Predictions for next days

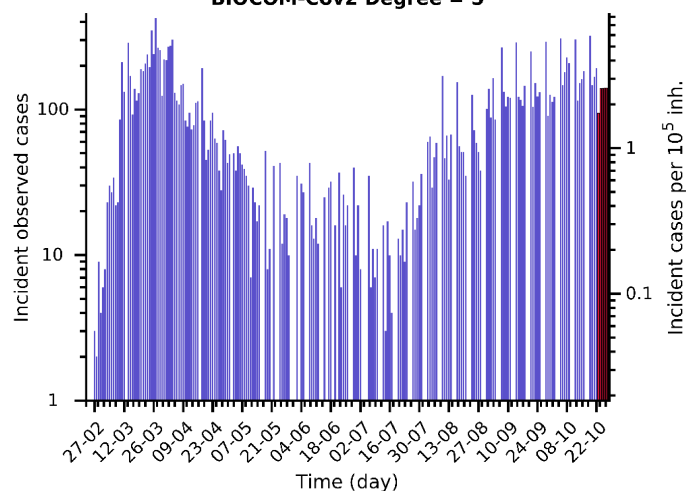
Day	Number of cases	95% Confidence Interval
23-10-2020	17058 (+94)	[ 16964 - 17643 ]
25-10-2020	17337 (+140)	[ 16964 - 17945 ]
27-10-2020	17618 (+140)	[ 16964 - 18277 ]

Current indicators

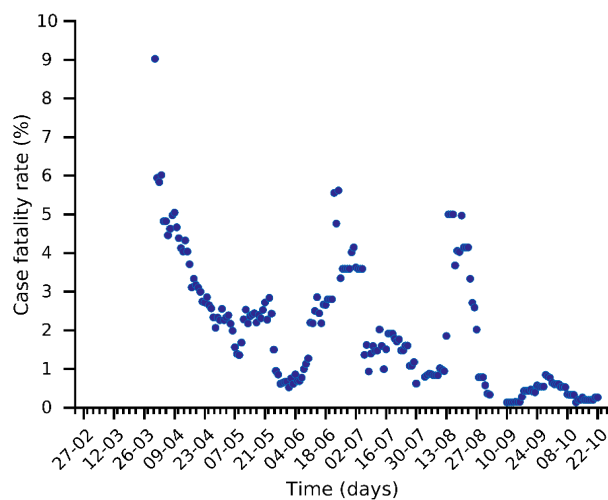
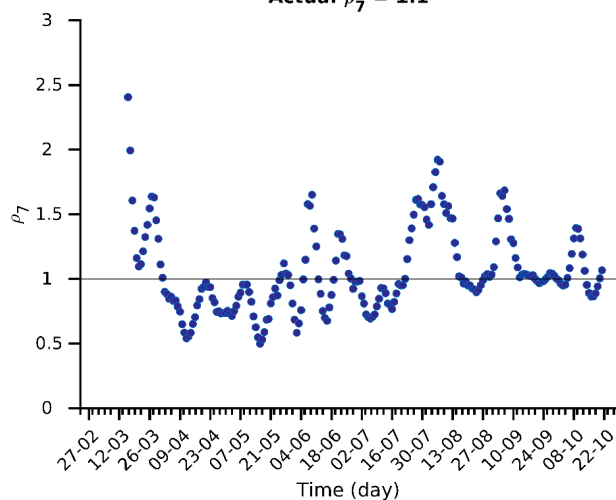
A <sub>14</sub>	EPG	CFR
36	38	0.26 %



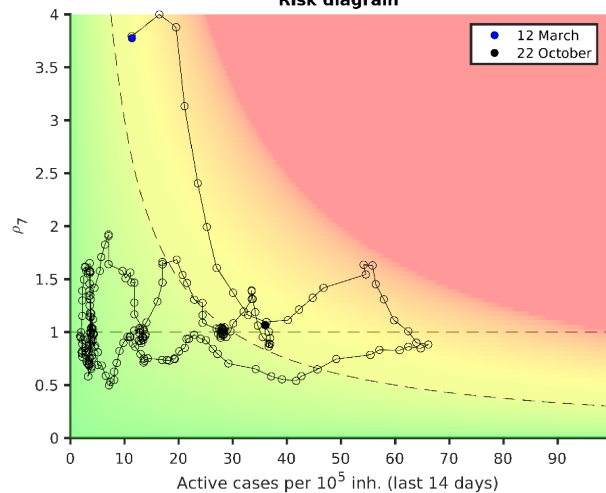
BIOCOM-Cov2 Degree = 5



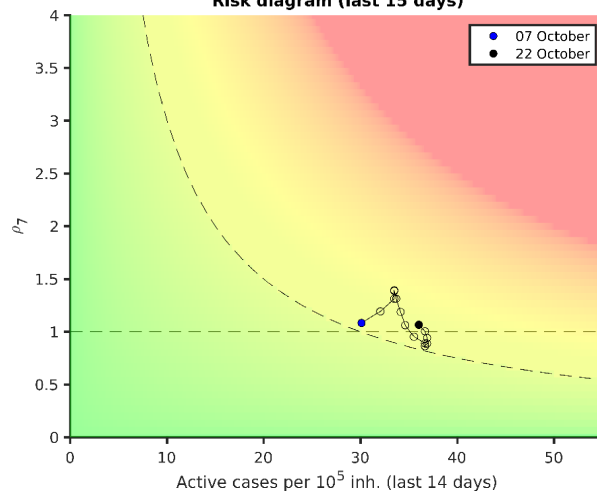
Actual  $\rho_7 = 1.1$



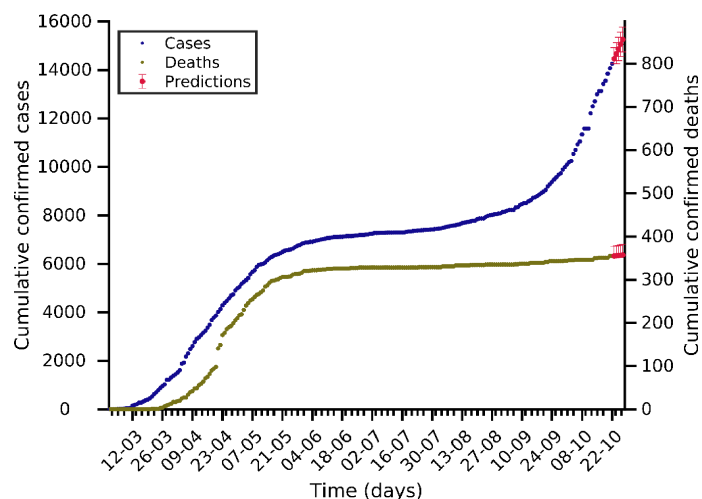
Risk diagram



Risk diagram (last 15 days)



# Finland 22-10-2020. Pop: 5.5M. Cumulative incidence: 257/10<sup>5</sup>

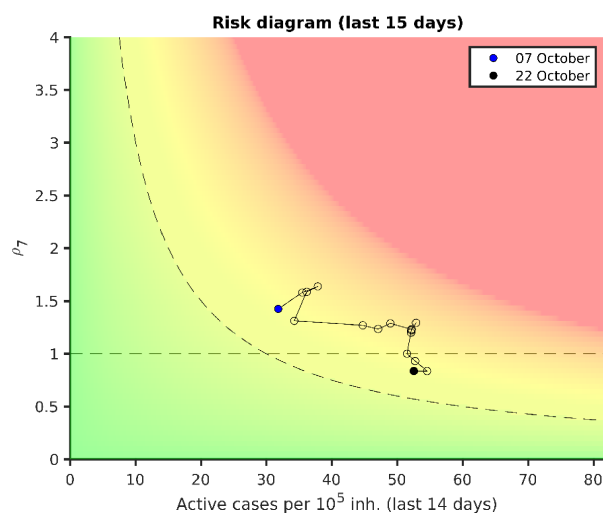
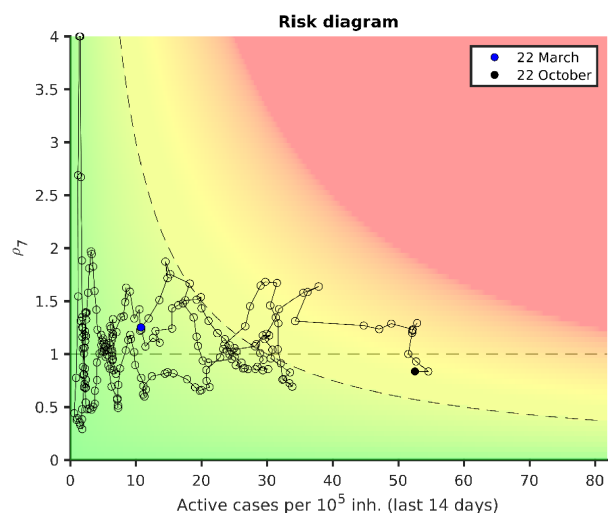
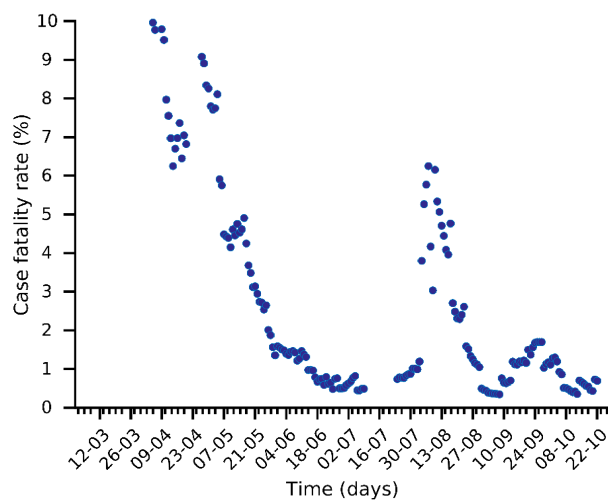
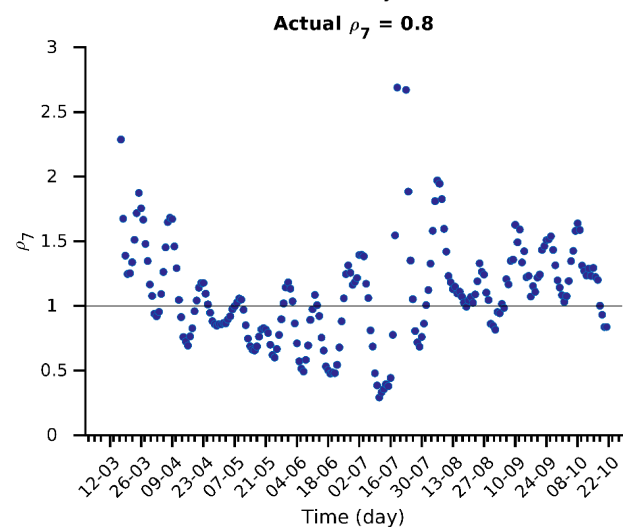
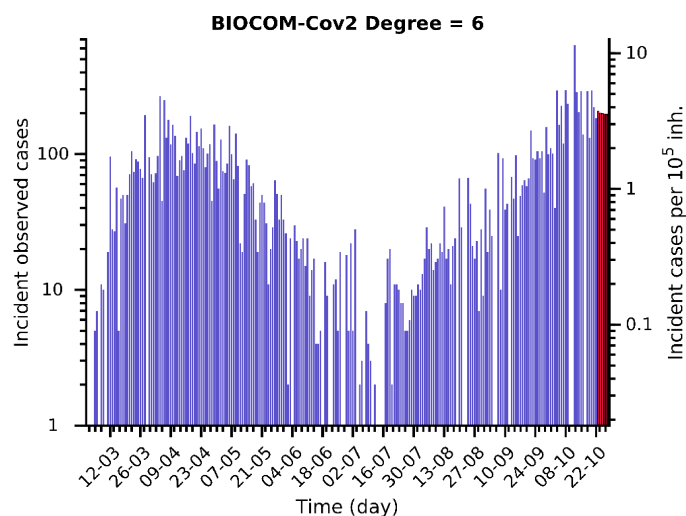
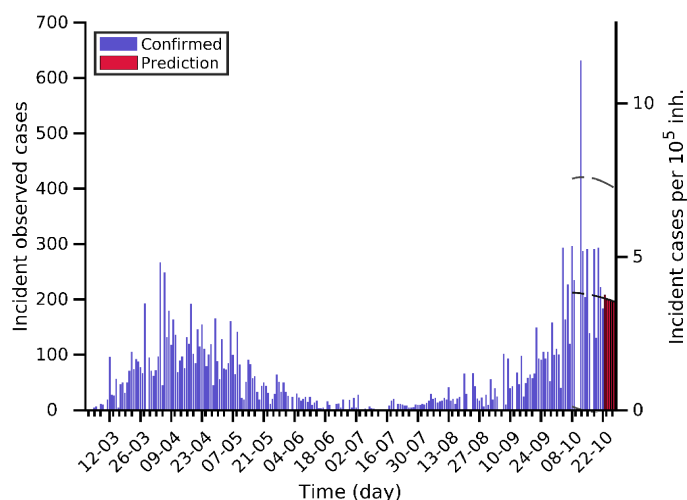


Predictions for next days

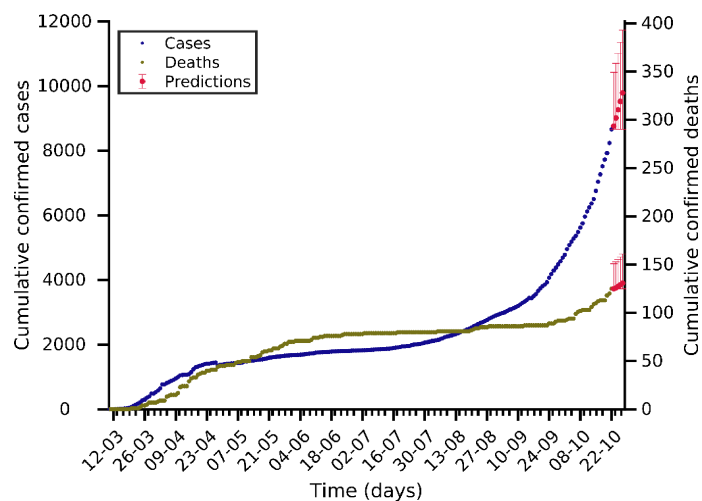
Day	Number of cases	95% Confidence Interval
23-10-2020	14463 (+208)	[ 14255 - 14925 ]
25-10-2020	14863 (+199)	[ 14383 - 15343 ]
27-10-2020	15258 (+197)	[ 14740 - 15776 ]

Current indicators

A <sub>14</sub>	EPG	CFR
53	44	0.69 %



# Lithuania 22-10-2020. Pop: 2.7M. Cumulative incidence: 318/10<sup>5</sup>

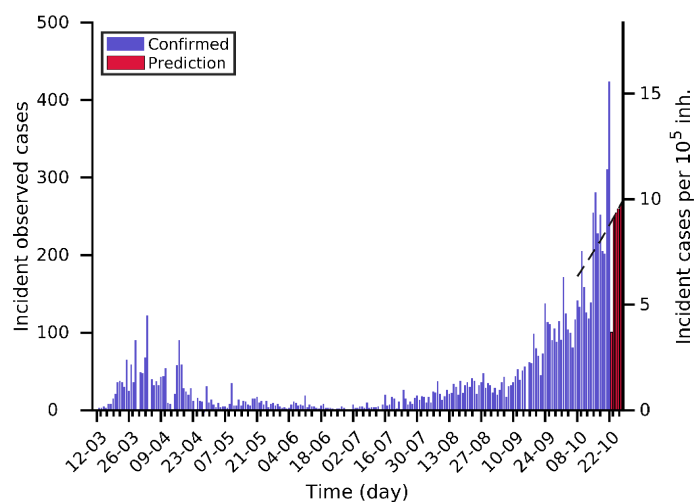


Predictions for next days

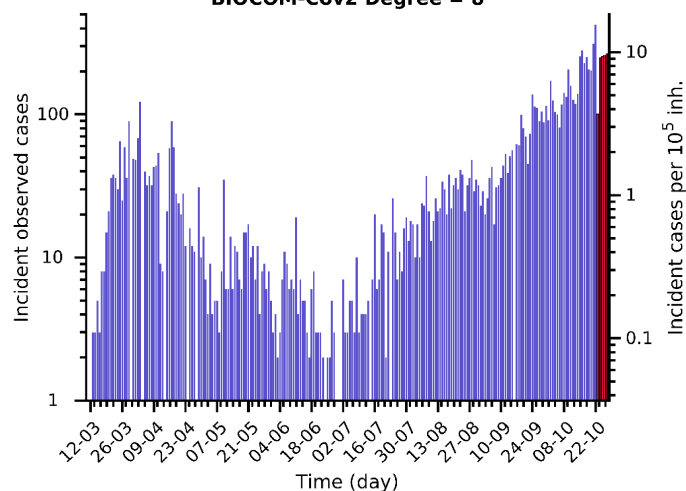
Day	Number of cases	95% Confidence Interval
23-10-2020	8764 (+101)	[ 8663 - 10427 ]
25-10-2020	9267 (+254)	[ 8663 - 11014 ]
27-10-2020	9792 (+265)	[ 8663 - 11735 ]

Current indicators

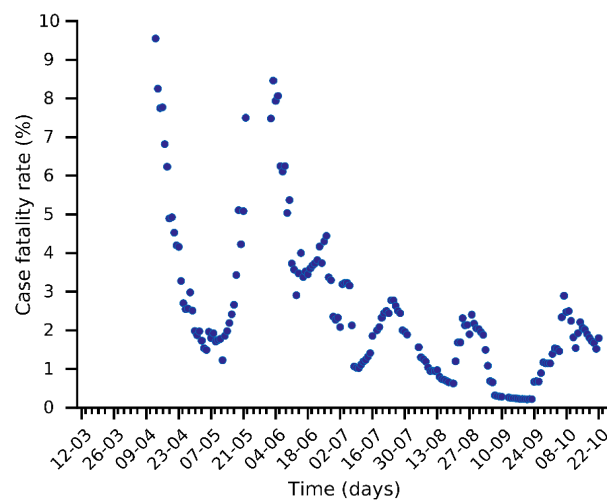
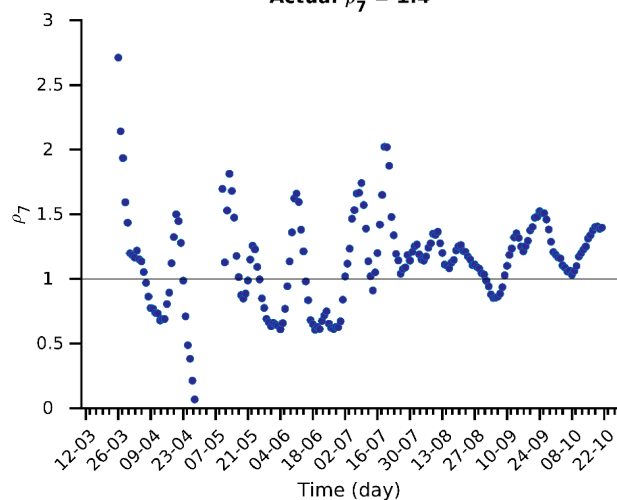
A <sub>14</sub>	EPG	CFR
112	156	1.80 %



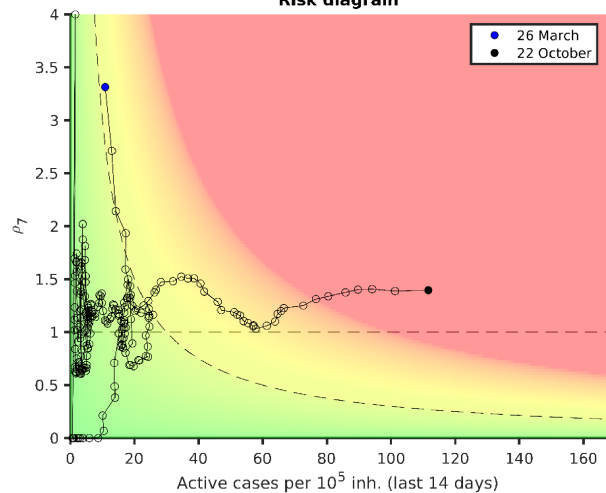
BIOCOM-Cov2 Degree = 8



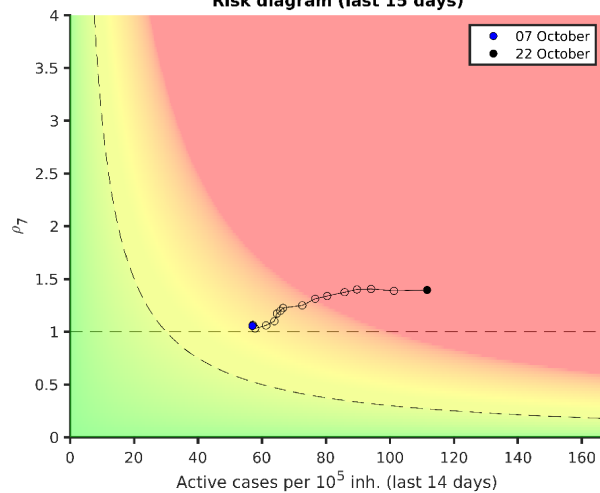
Actual  $\rho_7 = 1.4$



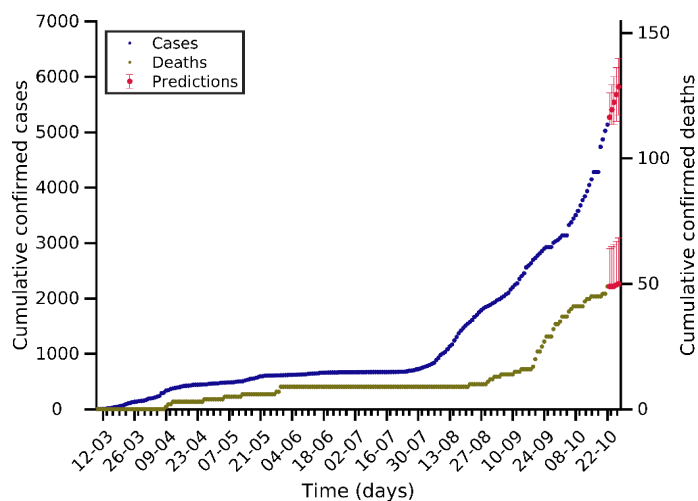
Risk diagram



Risk diagram (last 15 days)



# Malta 22-10-2020. Pop: 0.4M. Cumulative incidence: 1163/10<sup>5</sup>

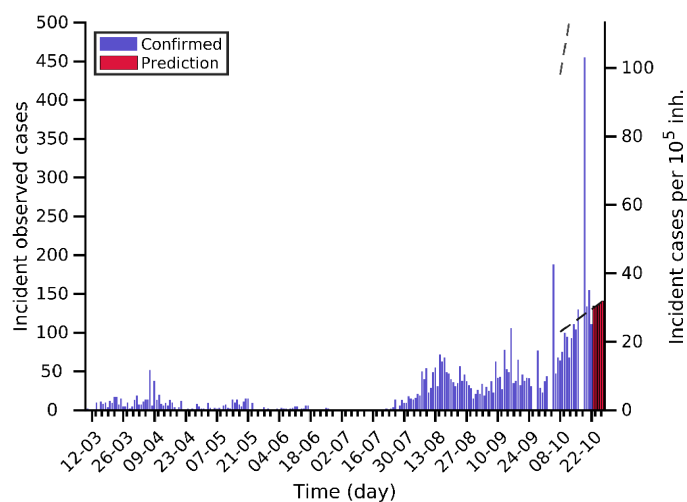


Predictions for next days

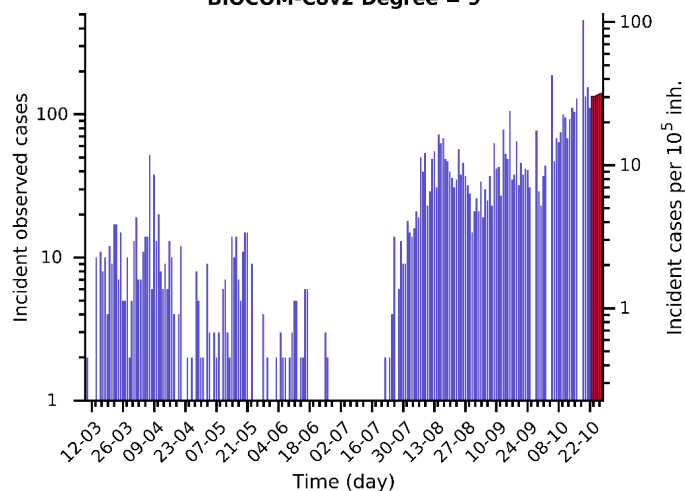
Day	Number of cases	95% Confidence Interval
23-10-2020	5271 (+134)	[ 5137 - 5713 ]
25-10-2020	5542 (+137)	[ 5137 - 6005 ]
27-10-2020	5821 (+141)	[ 5309 - 6333 ]

Current indicators

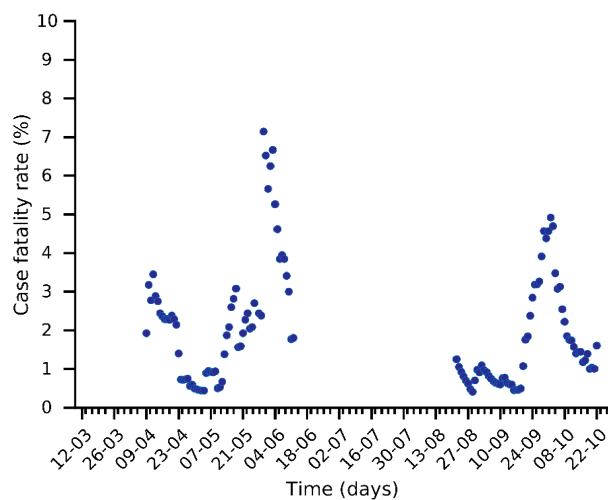
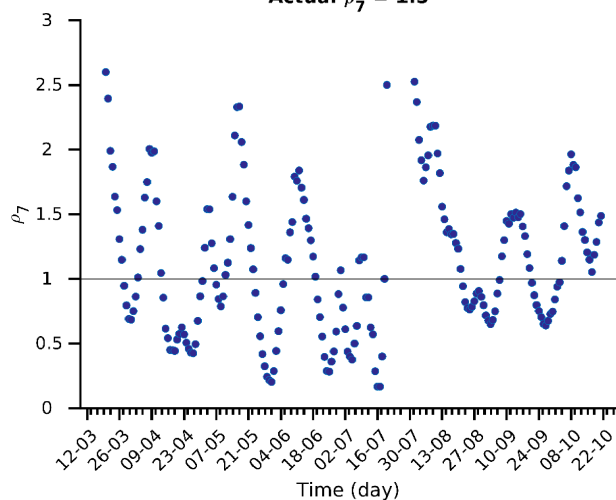
A <sub>14</sub>	EPG	CFR
369	549	1.60 %



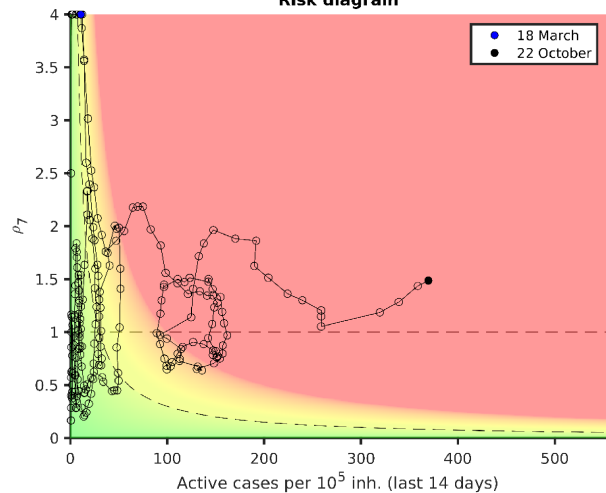
BIOCOM-Cov2 Degree = 9



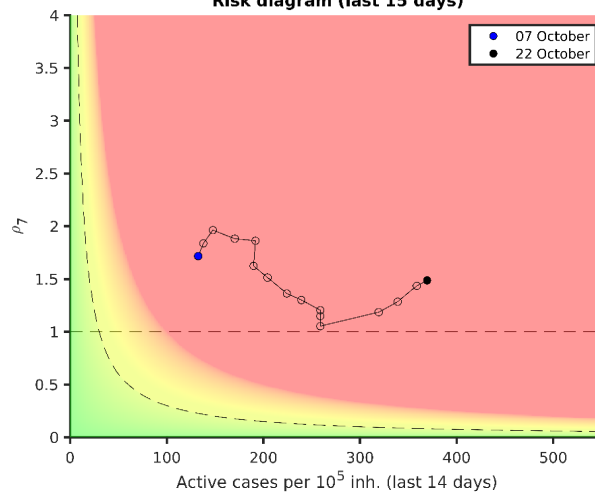
Actual  $\rho_7 = 1.5$



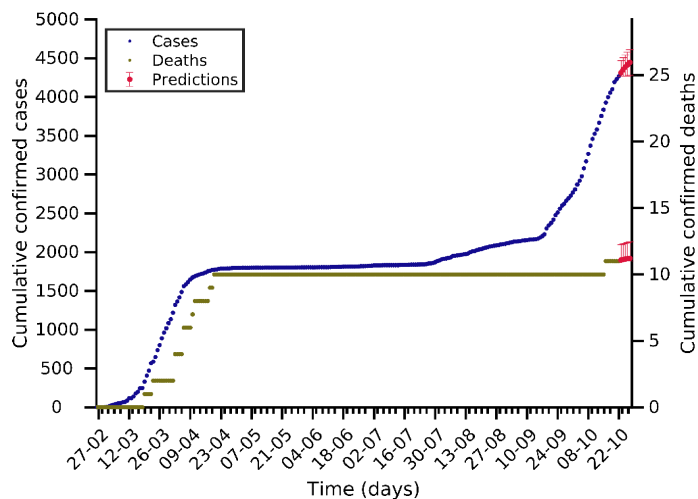
Risk diagram



Risk diagram (last 15 days)



# Iceland 22-10-2020. Pop: 0.3M. Cumulative incidence: 1251/10<sup>5</sup>

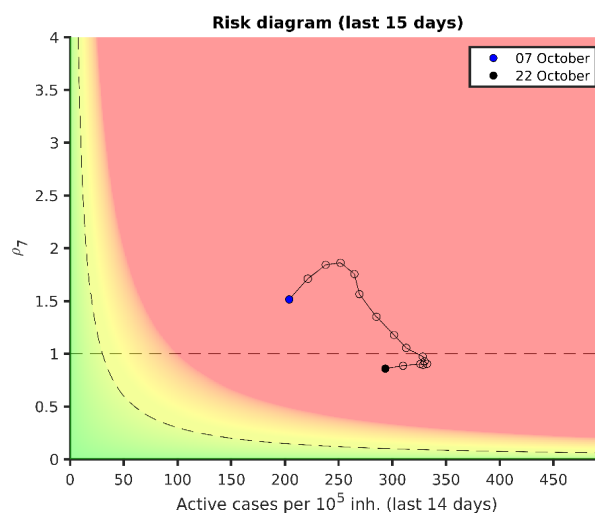
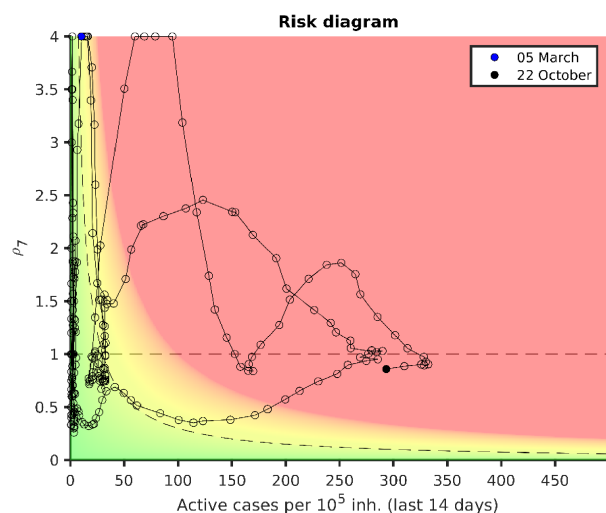
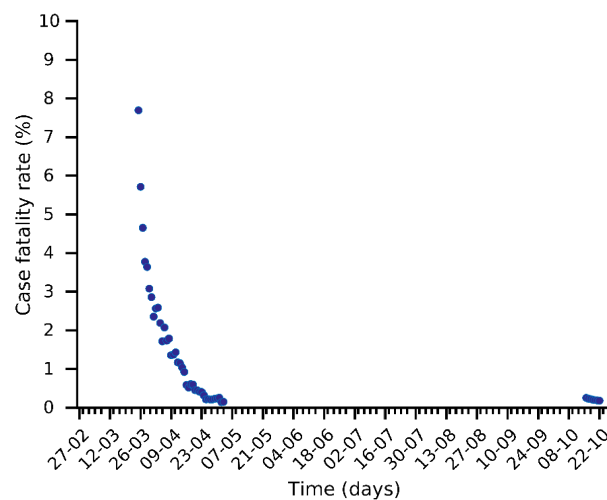
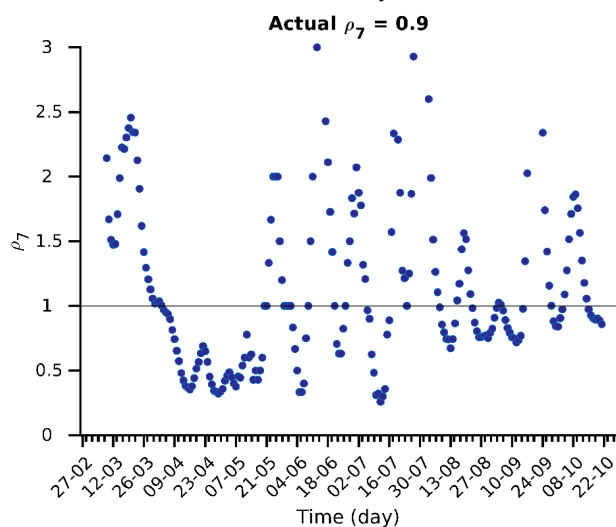
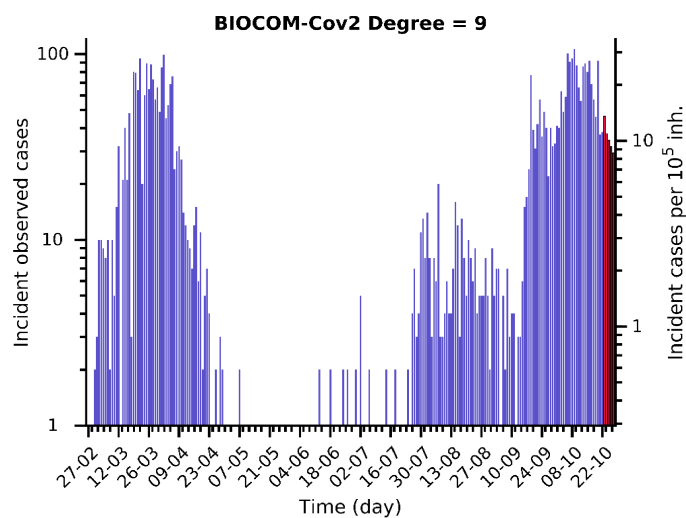
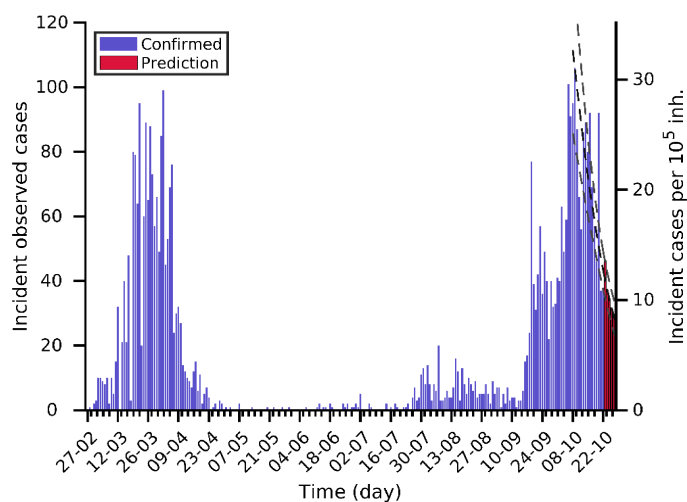


Predictions for next days

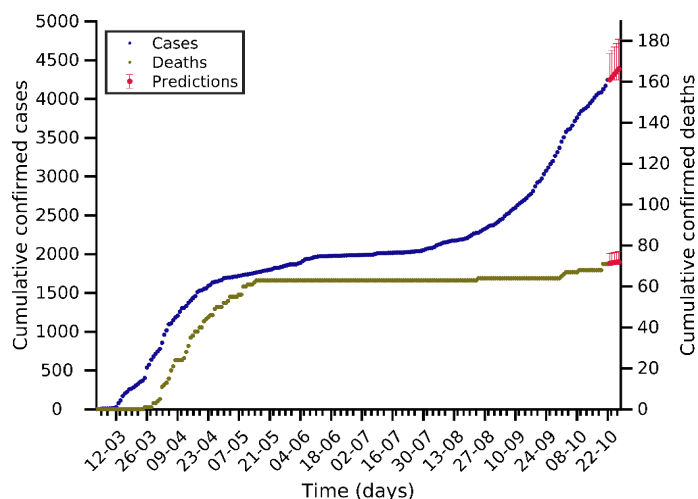
Day	Number of cases	95% Confidence Interval
23-10-2020	4314 (+46)	[ 4268 - 4469 ]
25-10-2020	4386 (+34)	[ 4268 - 4544 ]
27-10-2020	4447 (+29)	[ 4283 - 4611 ]

Current indicators

A <sub>14</sub>	EPG	CFR
293	252	0.18 %



# Estonia 22-10-2020. Pop: 1.3M. Cumulative incidence: 320/10<sup>5</sup>

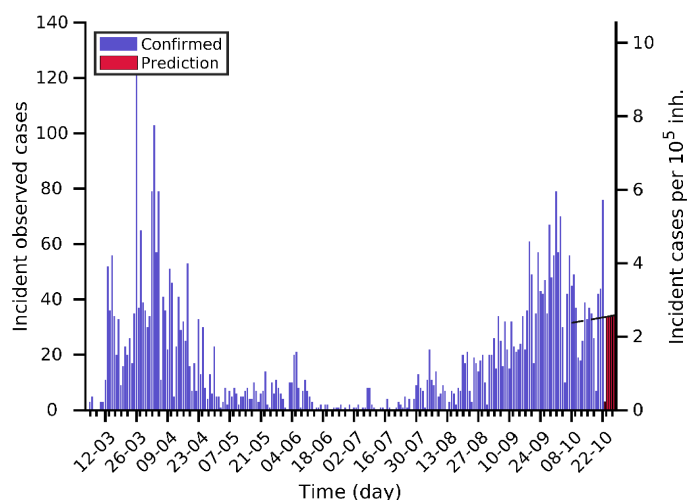


Predictions for next days

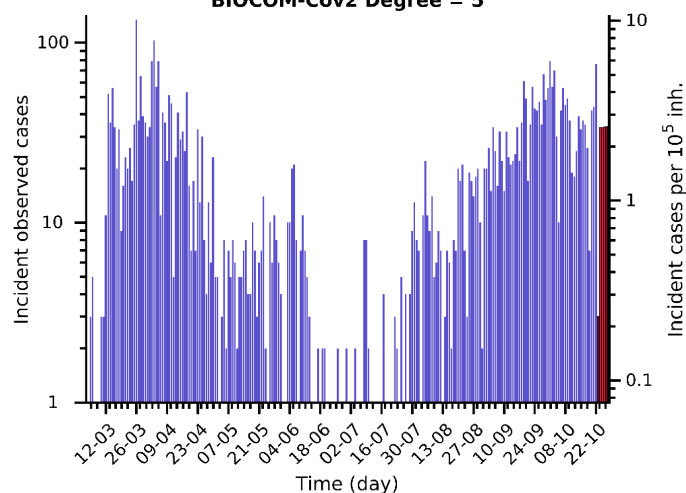
Day	Number of cases	95% Confidence Interval
23-10-2020	4250 (+3)	[ 4247 - 4589 ]
25-10-2020	4318 (+34)	[ 4247 - 4670 ]
27-10-2020	4386 (+34)	[ 4247 - 4769 ]

Current indicators

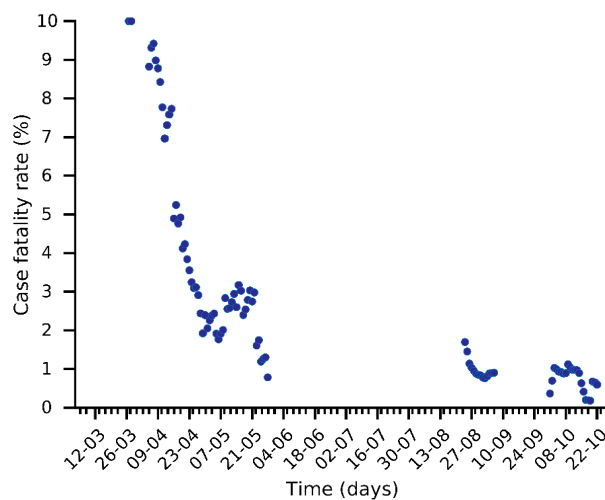
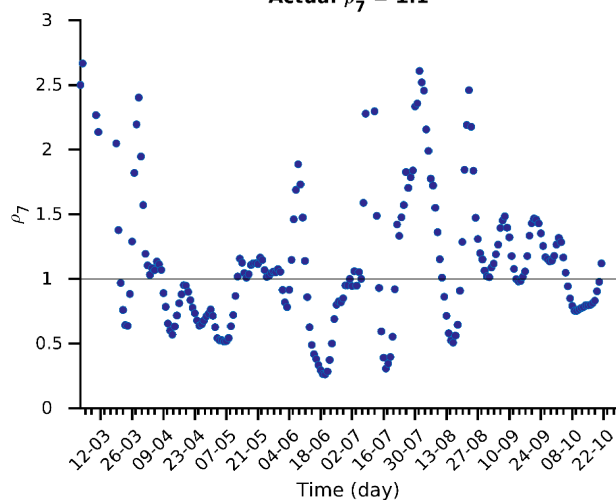
A <sub>14</sub>	EPG	CFR
37	41	0.60 %



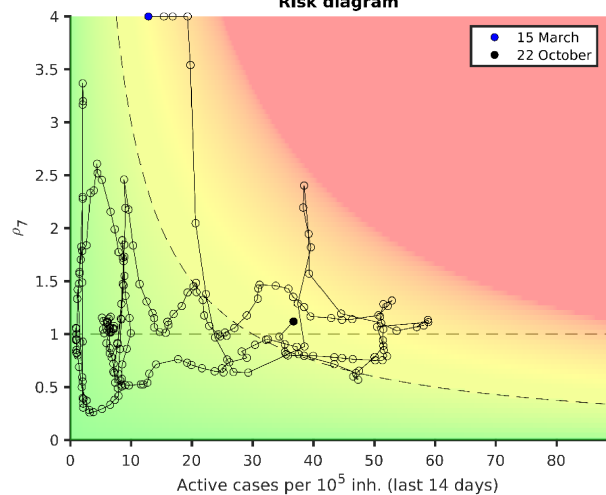
BIOCOM-Cov2 Degree = 5



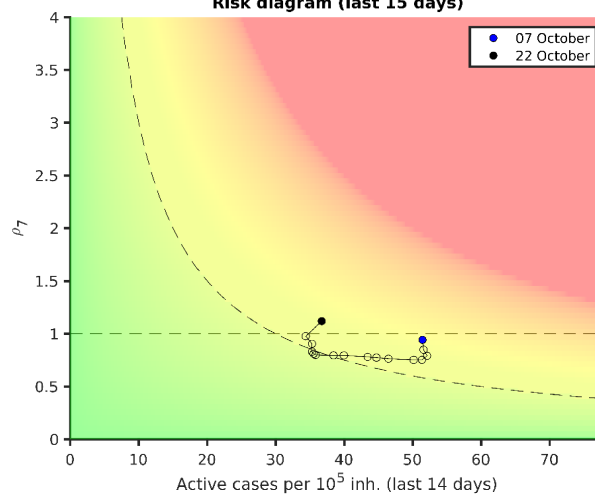
Actual  $\rho_7 = 1.1$



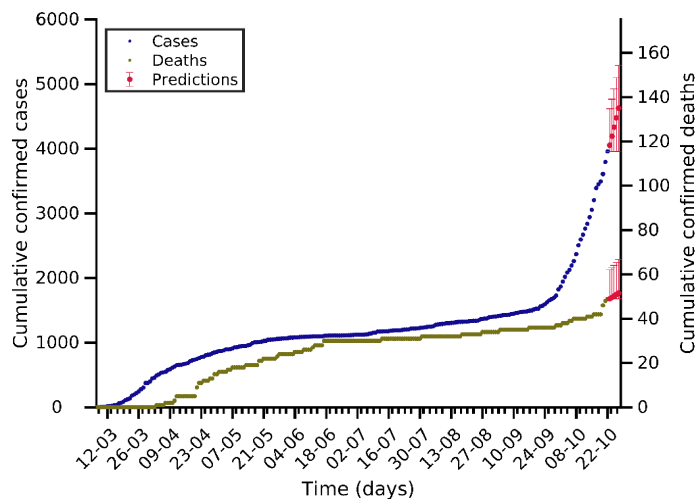
Risk diagram



Risk diagram (last 15 days)



# Latvia 22-10-2020. Pop: 1.9M. Cumulative incidence: 210/10<sup>5</sup>

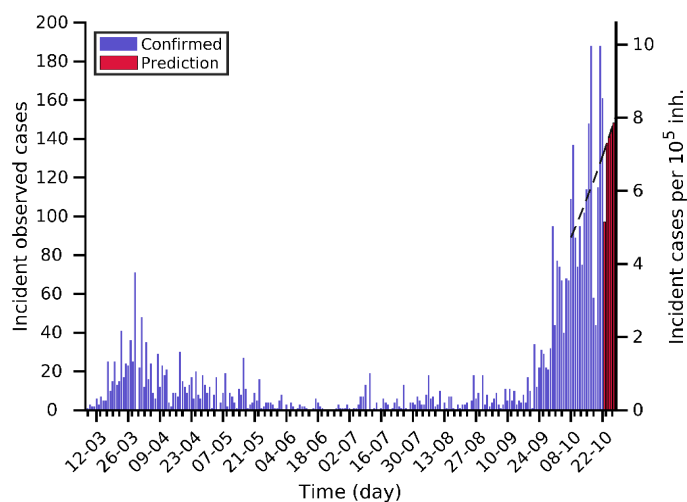


Predictions for next days

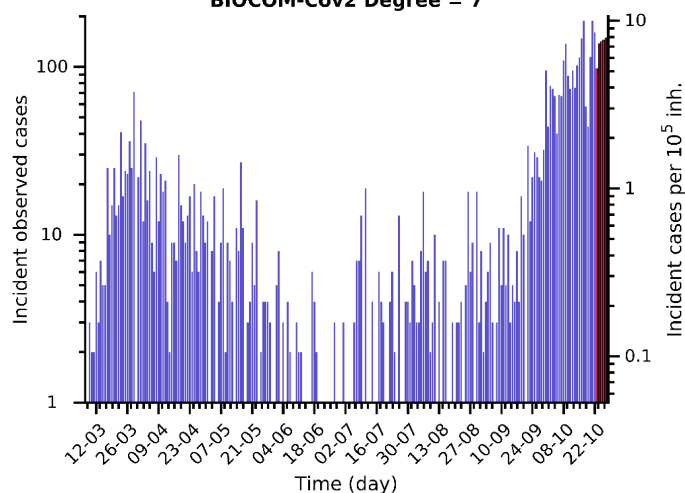
Day	Number of cases	95% Confidence Interval
23-10-2020	4055 (+97)	[ 3958 - 4618 ]
25-10-2020	4334 (+141)	[ 3958 - 4926 ]
27-10-2020	4627 (+148)	[ 3964 - 5290 ]

Current indicators

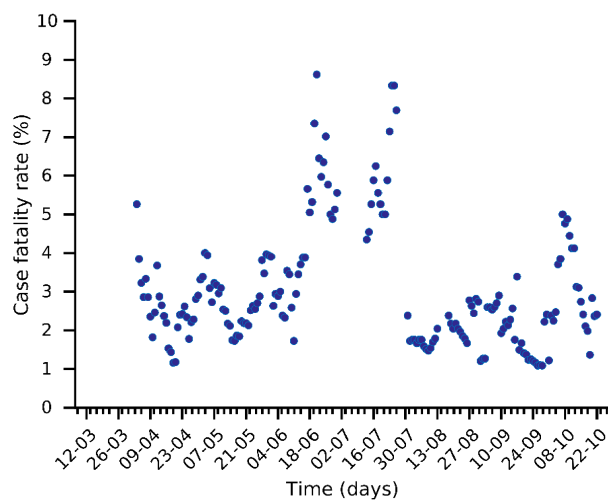
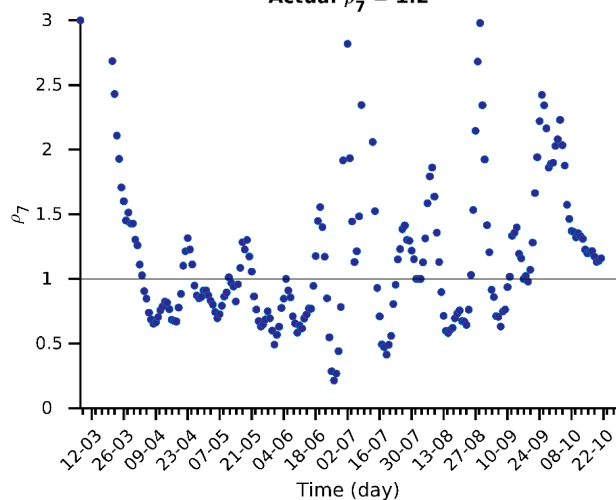
A <sub>14</sub>	EPG	CFR
84	98	2.41 %



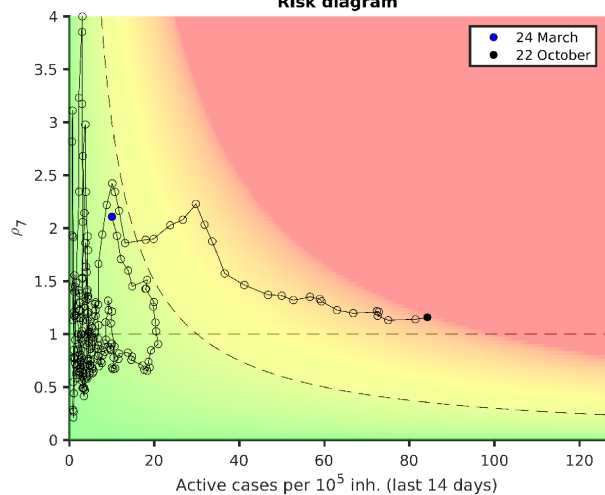
BIOCOM-Cov2 Degree = 7



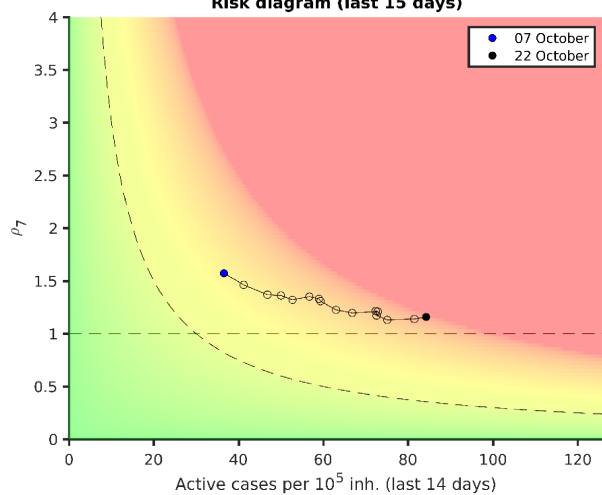
Actual  $\rho_7 = 1.2$



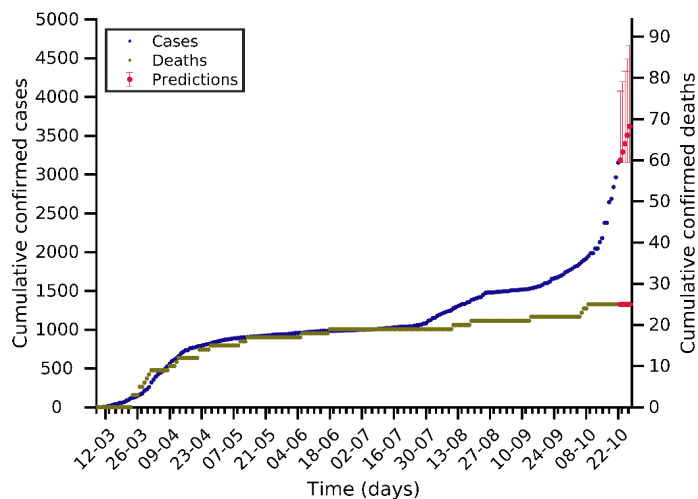
Risk diagram



Risk diagram (last 15 days)



# Cyprus 22-10-2020. Pop: 1.2M. Cumulative incidence: 261/10<sup>5</sup>

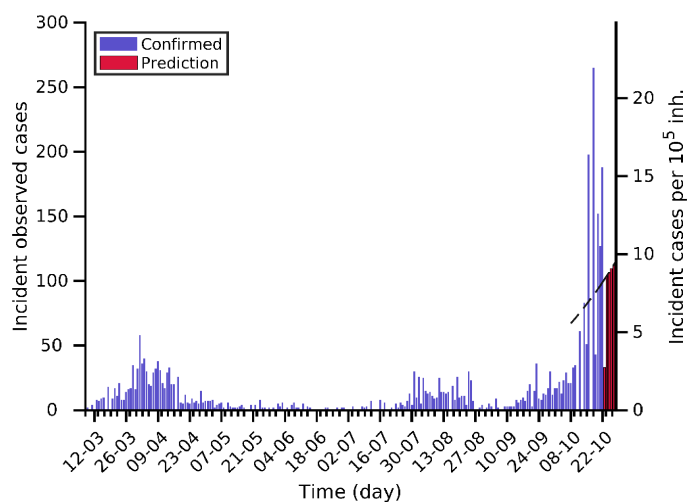


Predictions for next days

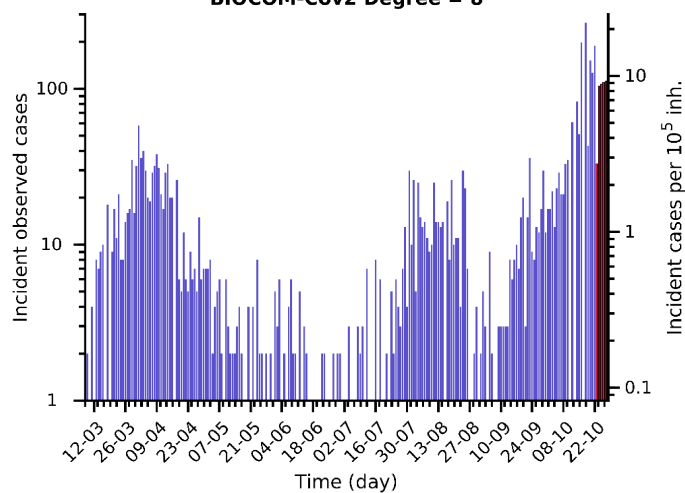
Day	Number of cases	95% Confidence Interval
23-10-2020	3187 (+33)	[ 3154 - 4076 ]
25-10-2020	3398 (+107)	[ 3154 - 4334 ]
27-10-2020	3620 (+112)	[ 3154 - 4668 ]

Current indicators

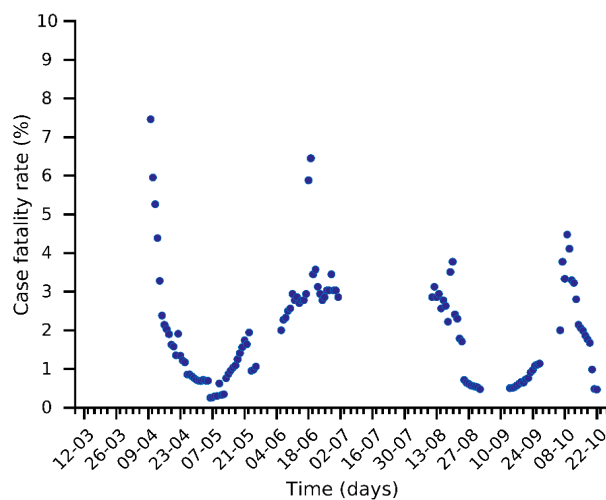
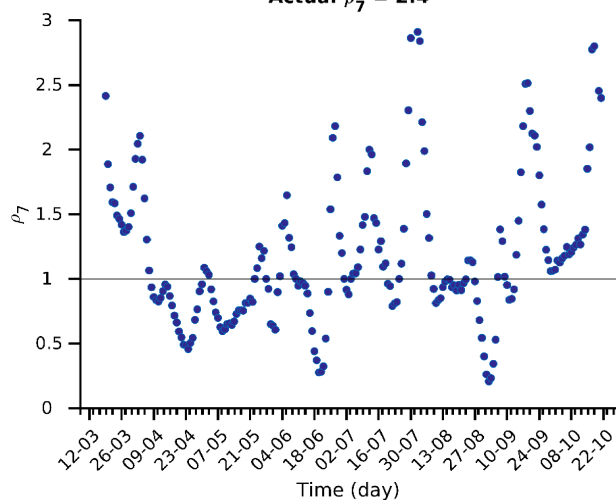
A <sub>14</sub>	EPG	CFR
102	246	0.47 %



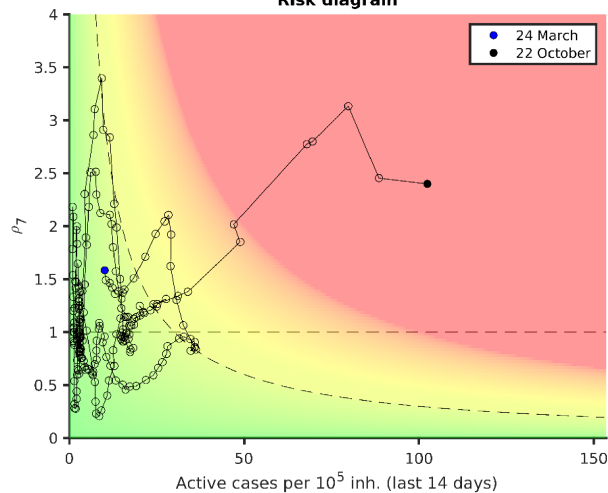
BIOCOM-Cov2 Degree = 8



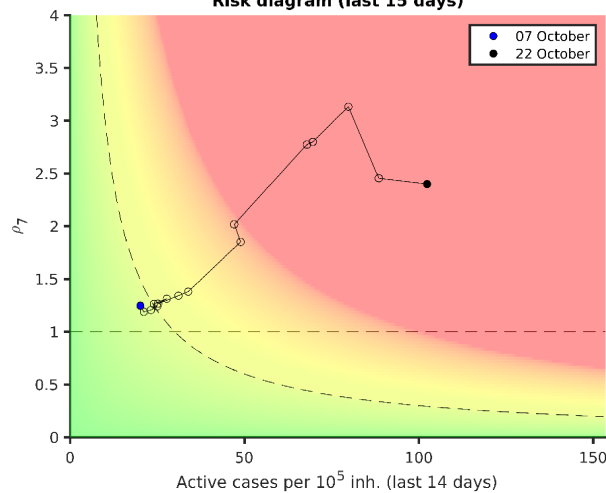
Actual  $\rho_7 = 2.4$



Risk diagram



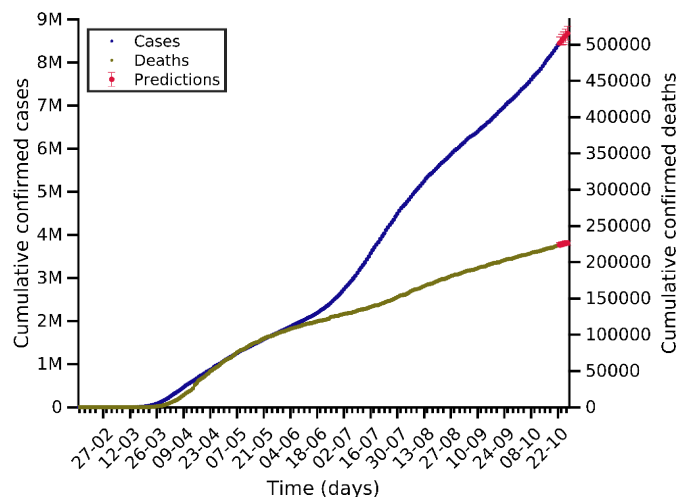
Risk diagram (last 15 days)





## **(2) Analysis and prediction of COVID-19 for other countries**

# USA 22-10-2020. Pop: 331.0M. Cumulative incidence: 2540/10<sup>5</sup>

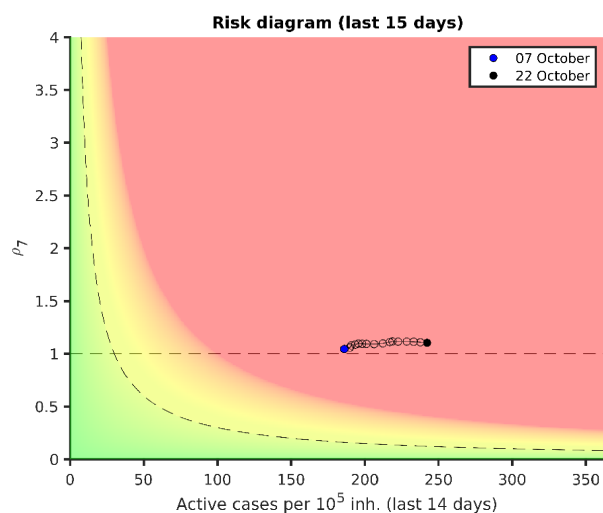
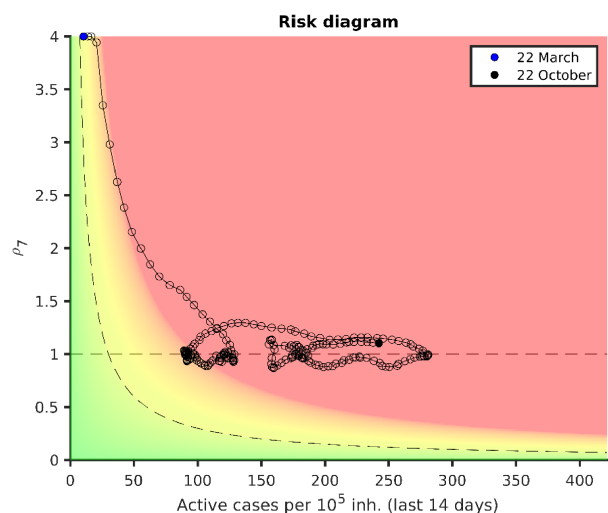
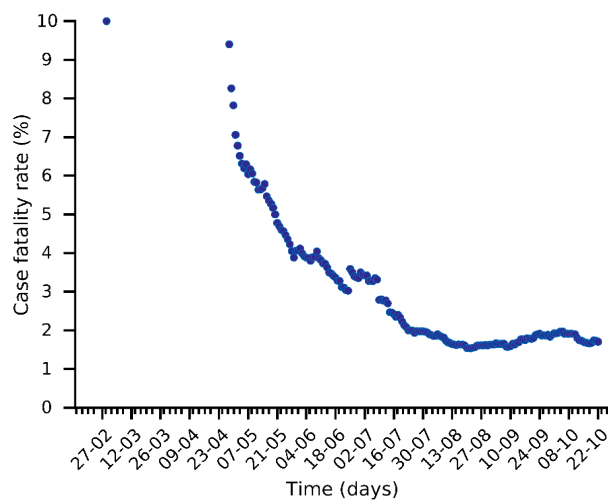
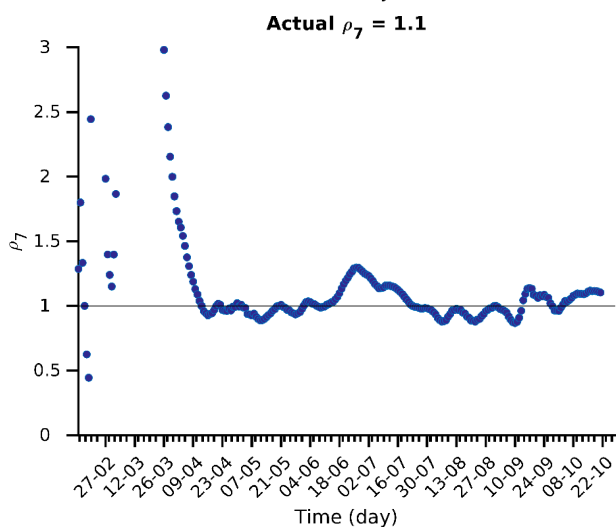
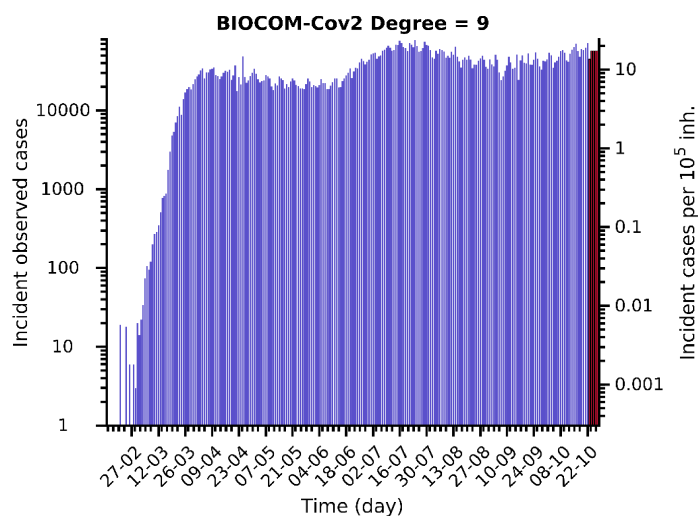
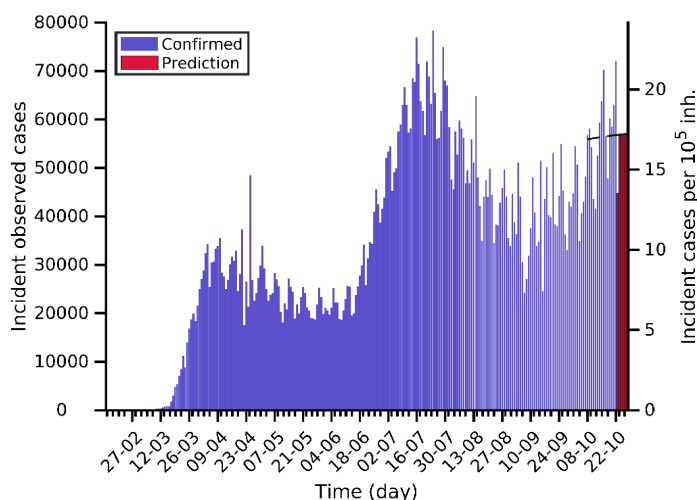


Predictions for next days

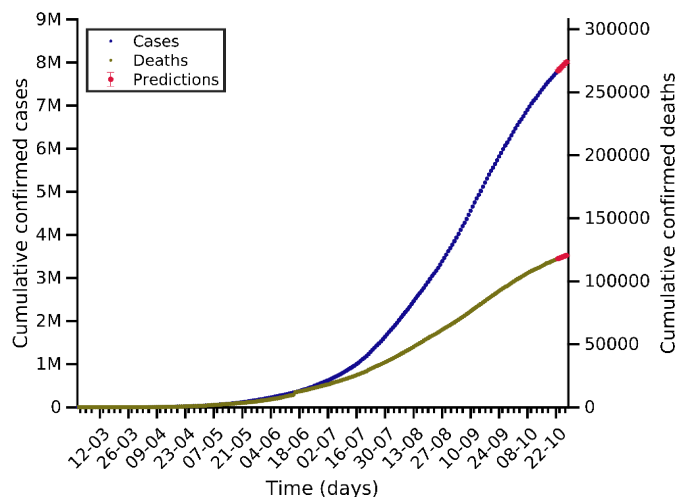
Day	Number of cases	95% Confidence Interval
23-10-2020	8453139 (+44799)	[ 8408340 - 8594484 ]
25-10-2020	8566892 (+56896)	[ 8419921 - 8713863 ]
27-10-2020	8680795 (+56969)	[ 8521736 - 8839853 ]

Current indicators

A <sub>14</sub>	EPG	CFR
242	267	1.70 %



# India 22-10-2020. Pop: 1353.0M. Cumulative incidence: 574/10<sup>5</sup>

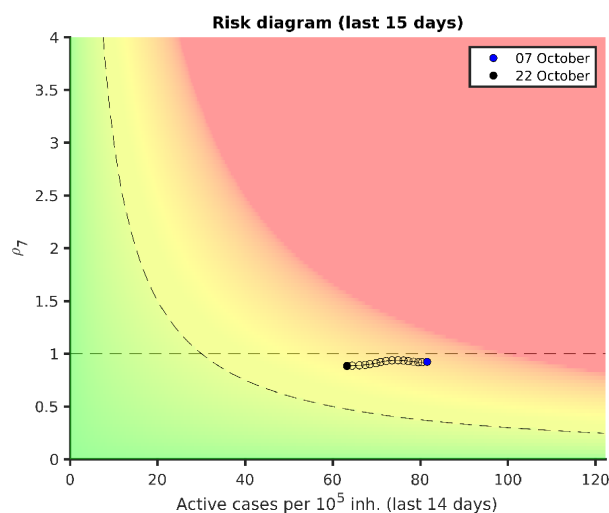
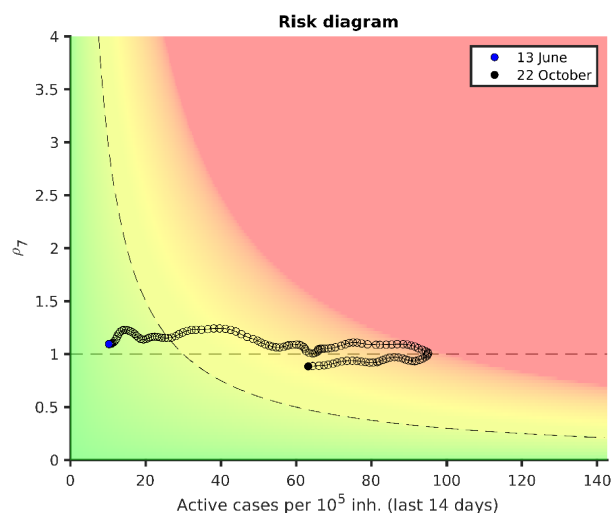
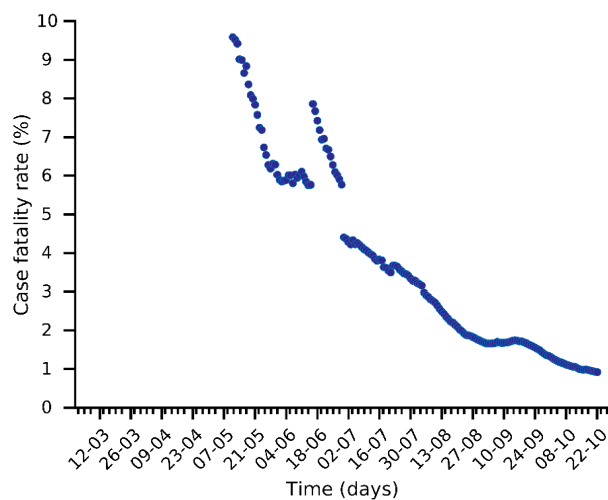
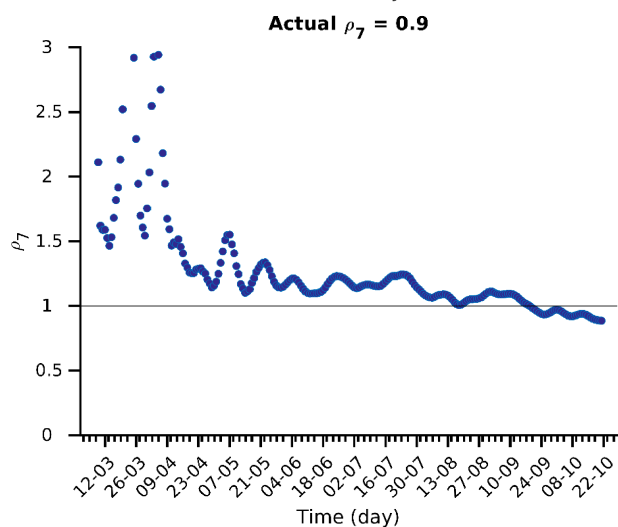
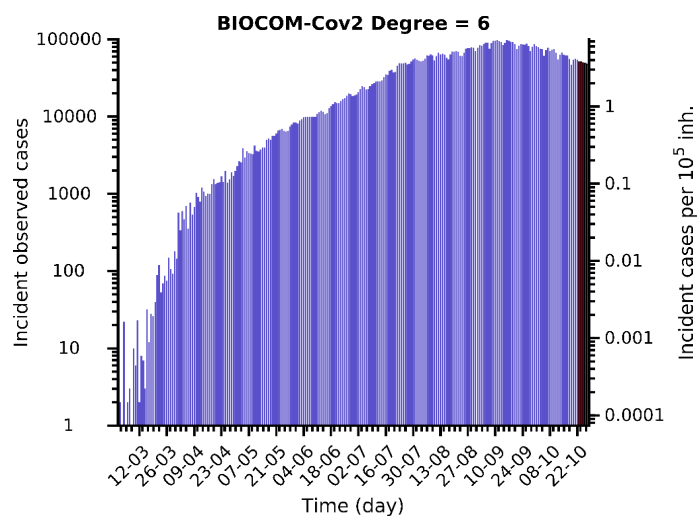
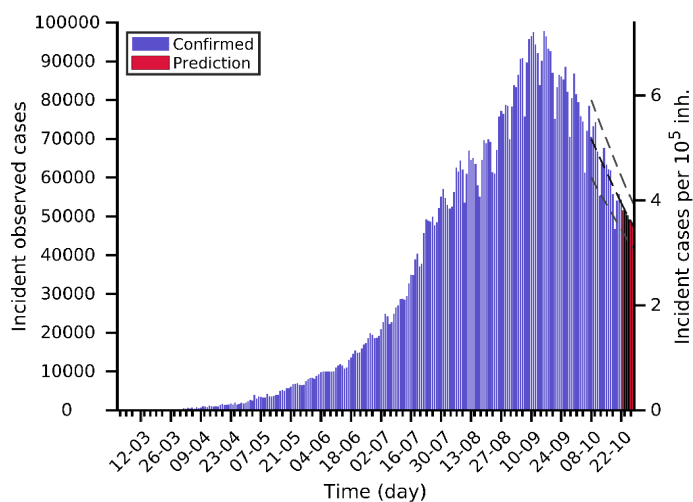


Predictions for next days

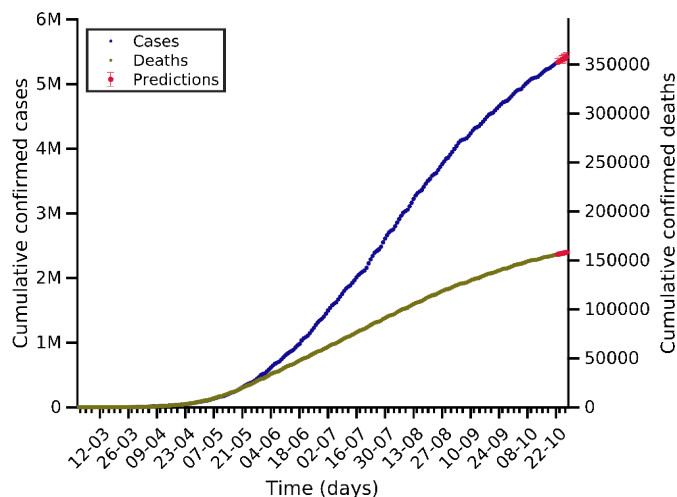
Day	Number of cases	95% Confidence Interval
23-10-2020	7812837 (+51525)	[ 7786008 - 7839666 ]
25-10-2020	7914299 (+50191)	[ 7886565 - 7942033 ]
27-10-2020	8011501 (+48076)	[ 7981950 - 8041052 ]

Current indicators

A <sub>14</sub>	EPG	CFR
63	56	0.92 %



# Brazil 22-10-2020. Pop: 212.6M. Cumulative incidence: 2505/10<sup>5</sup>

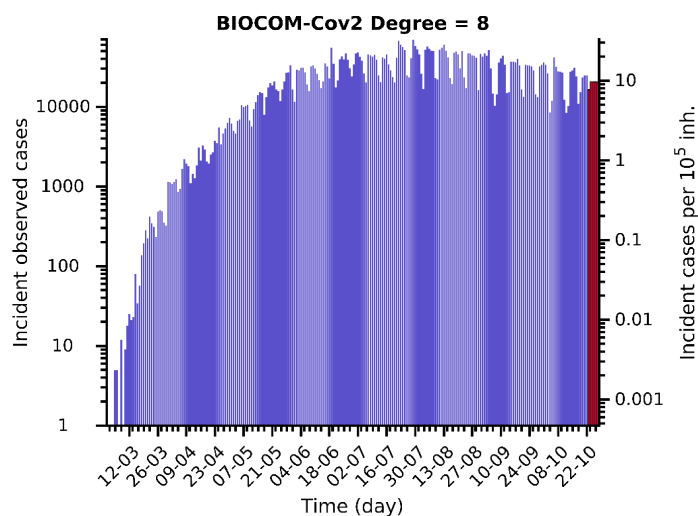
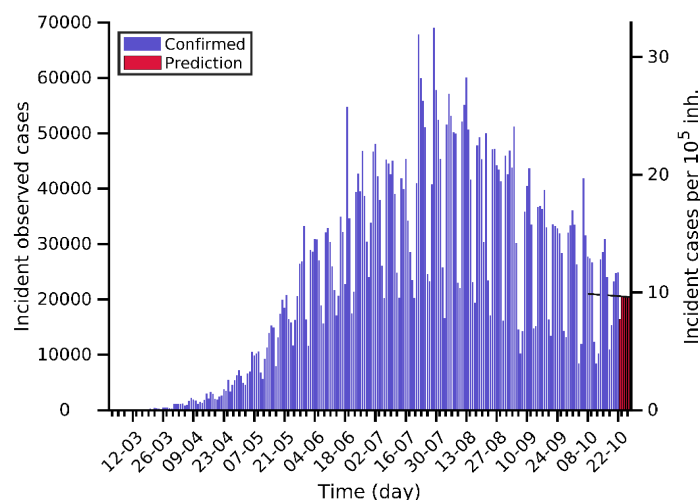


Predictions for next days

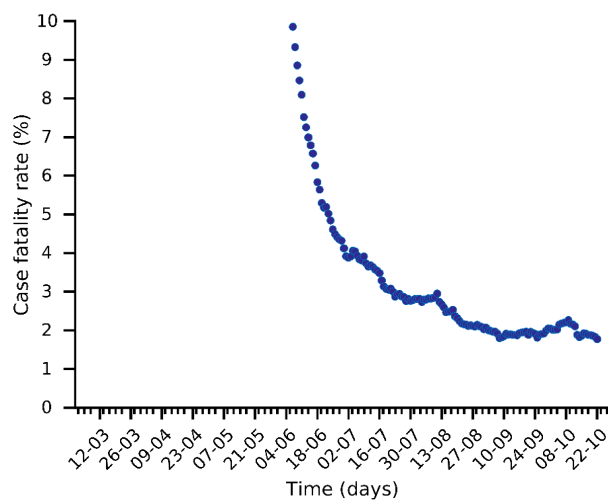
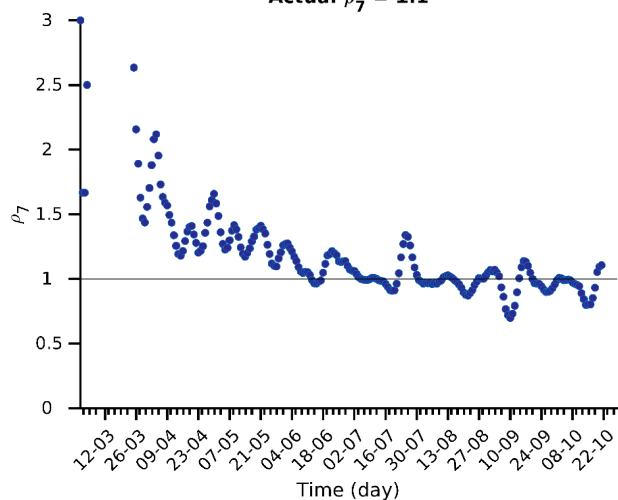
Day	Number of cases	95% Confidence Interval
23-10-2020	5340081 (+16451)	[ 5323630 - 5397206 ]
25-10-2020	5381118 (+20502)	[ 5323630 - 5440450 ]
27-10-2020	5422023 (+20436)	[ 5357999 - 5486048 ]

Current indicators

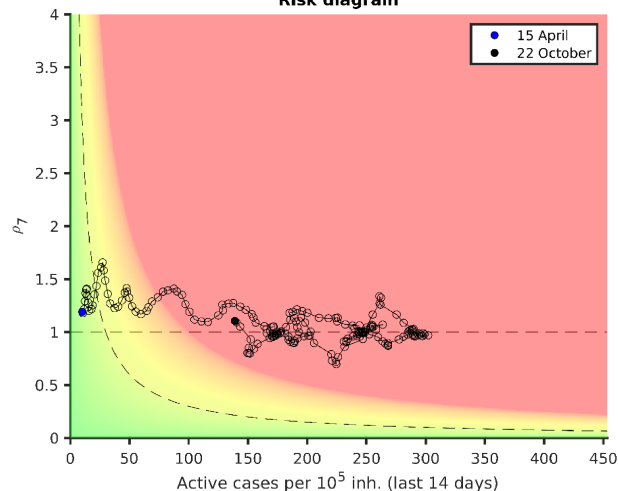
A <sub>14</sub>	EPG	CFR
139	154	1.77 %



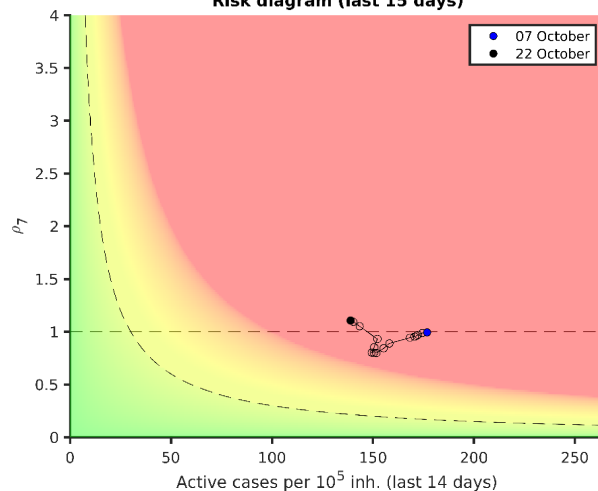
Actual  $\rho_7 = 1.1$



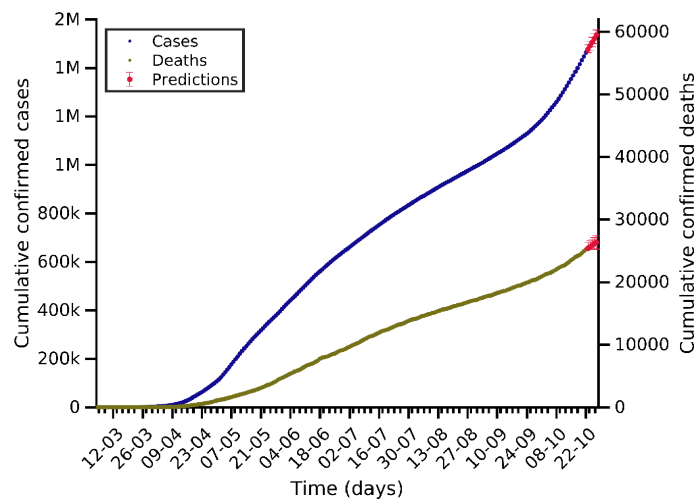
Risk diagram



Risk diagram (last 15 days)



# Russia 22-10-2020. Pop: 145.9M. Cumulative incidence: 1003/10<sup>5</sup>

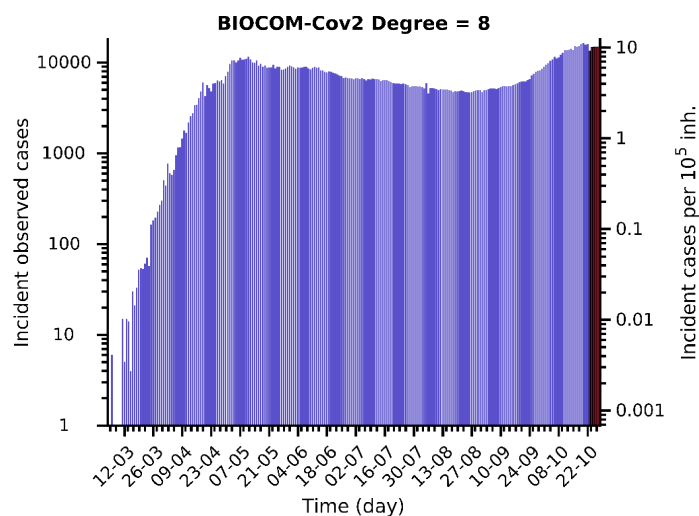
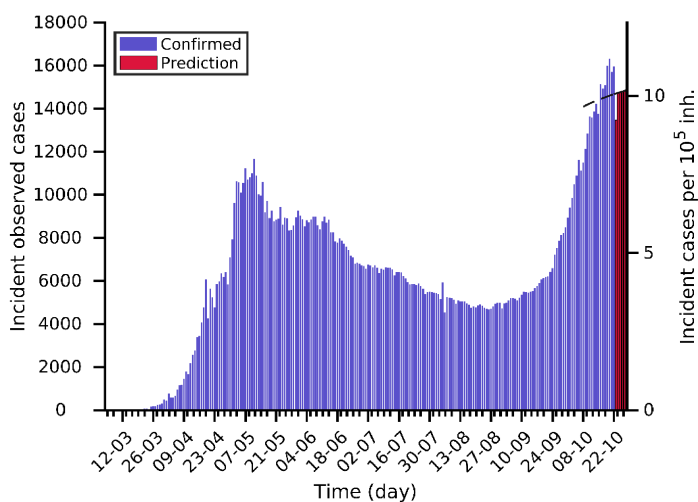


Predictions for next days

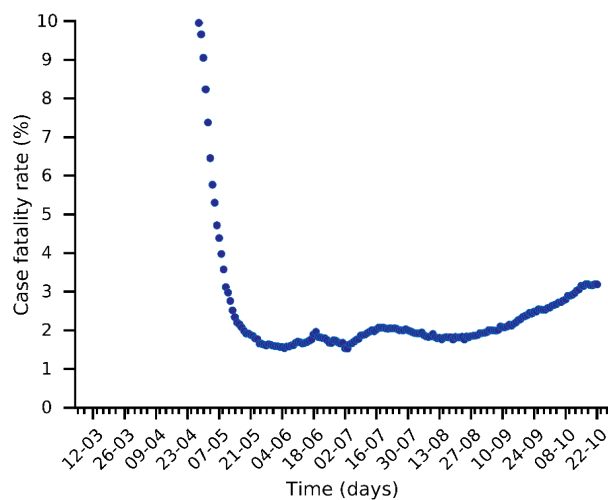
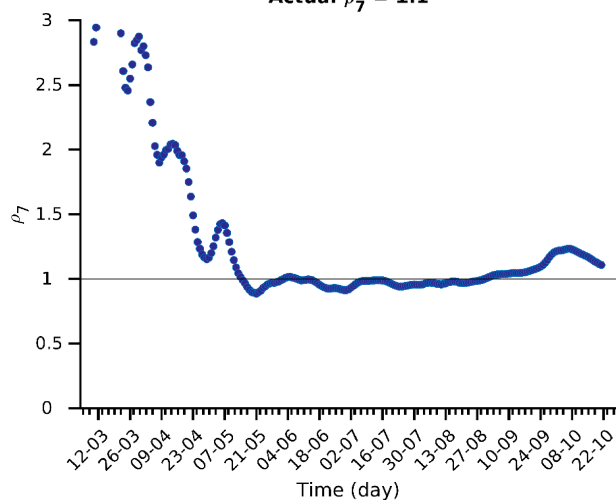
Day	Number of cases	95% Confidence Interval
23-10-2020	1476778 (+13472)	[ 1463306 - 1495609 ]
25-10-2020	1506293 (+14773)	[ 1486695 - 1525891 ]
27-10-2020	1535928 (+14832)	[ 1514667 - 1557189 ]

Current indicators

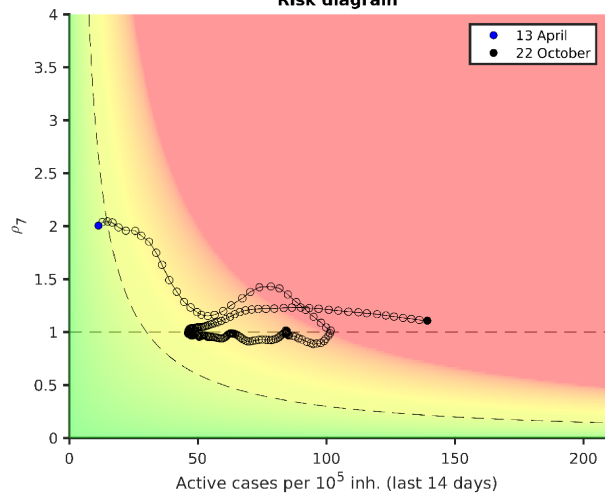
A <sub>14</sub>	EPG	CFR
139	154	3.19 %



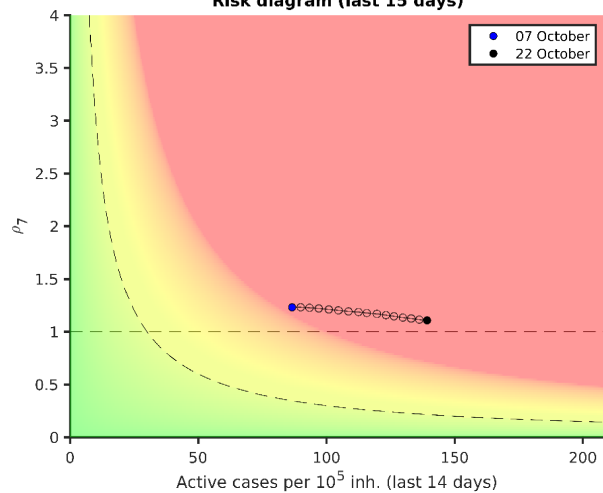
Actual  $\rho_7 = 1.1$



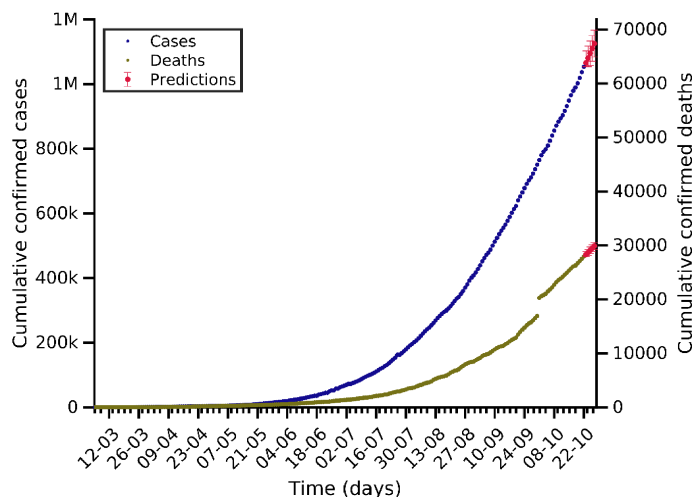
Risk diagram



Risk diagram (last 15 days)



# Argentina 22-10-2020. Pop: 45.2M. Cumulative incidence: 2331/10<sup>5</sup>

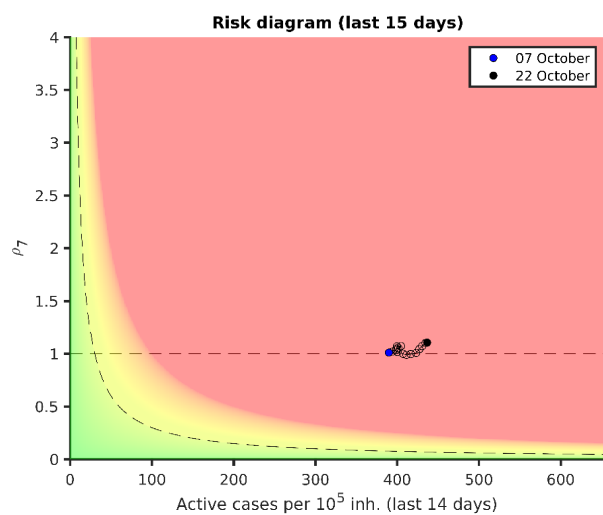
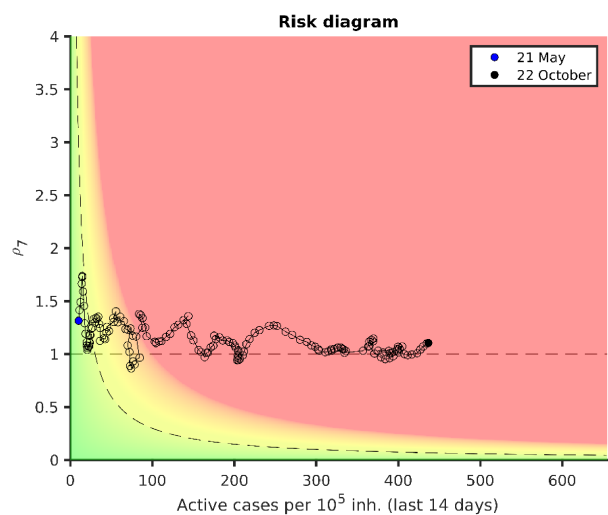
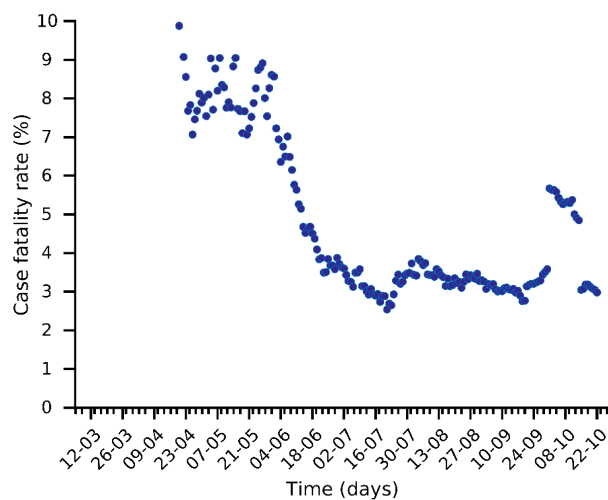
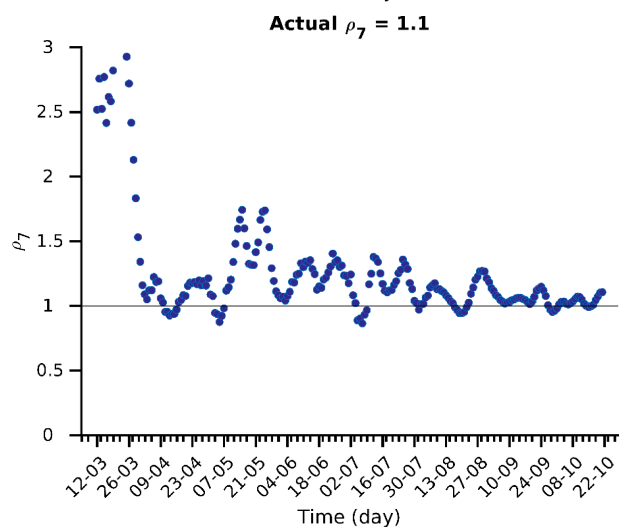
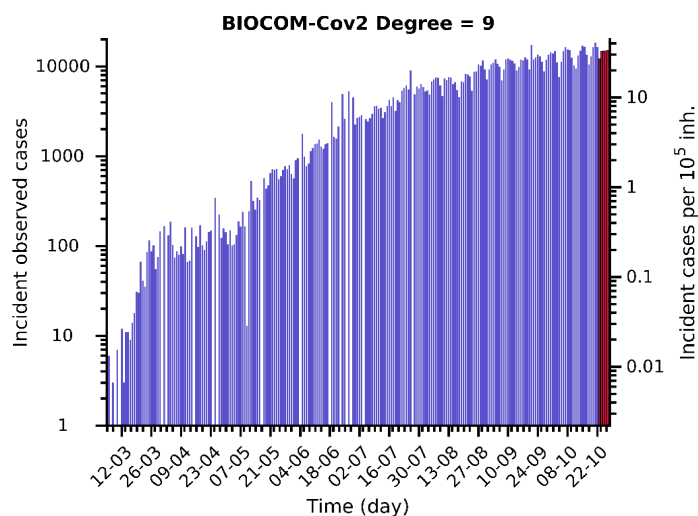
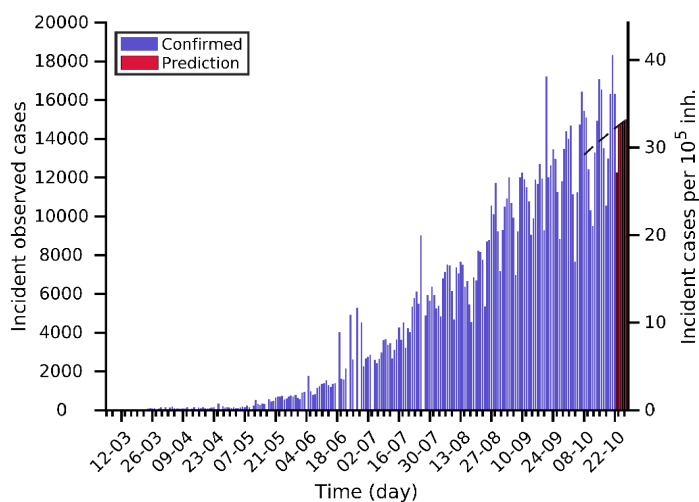


Predictions for next days

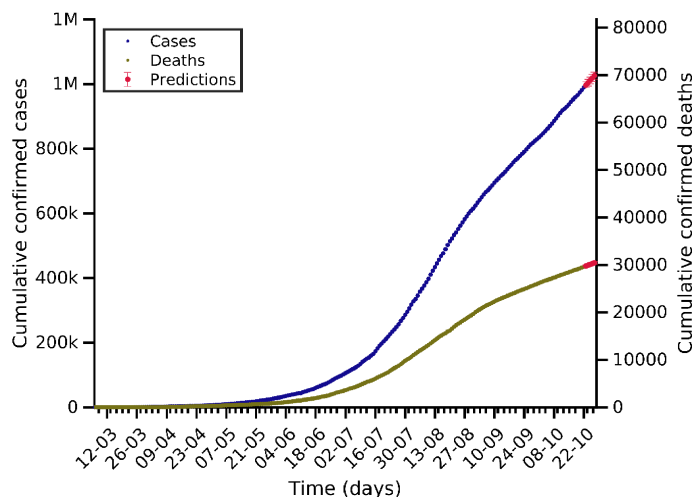
Day	Number of cases	95% Confidence Interval
23-10-2020	1065884 (+12247)	[ 1053637 - 1102306 ]
25-10-2020	1095410 (+14807)	[ 1057436 - 1133383 ]
27-10-2020	1125285 (+14981)	[ 1083891 - 1166679 ]

Current indicators

A <sub>14</sub>	EPG	CFR
437	483	2.98 %



# Colombia 22-10-2020. Pop: 50.9M. Cumulative incidence: 1946/10<sup>5</sup>

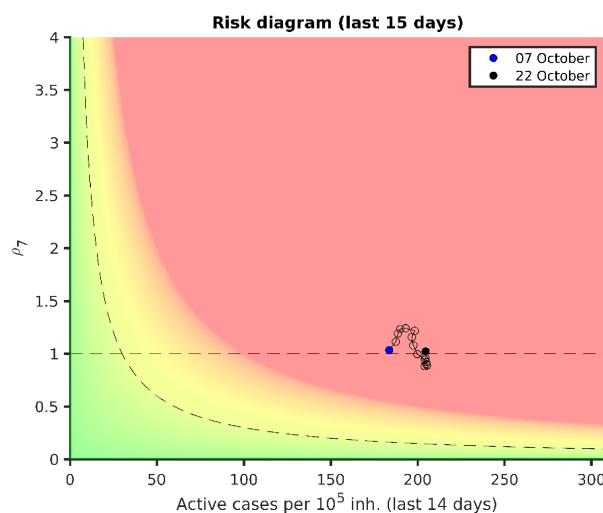
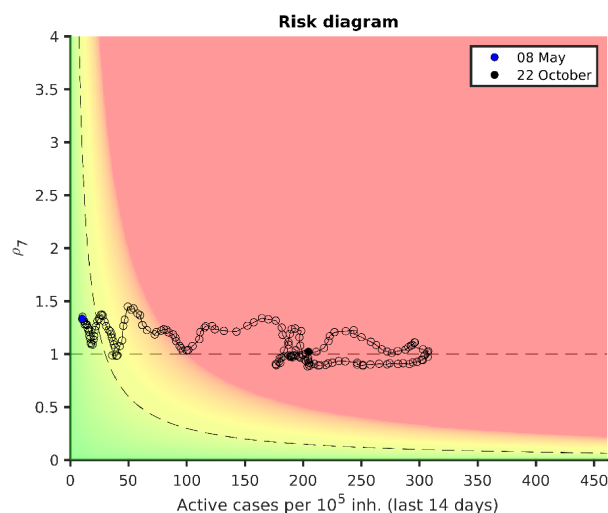
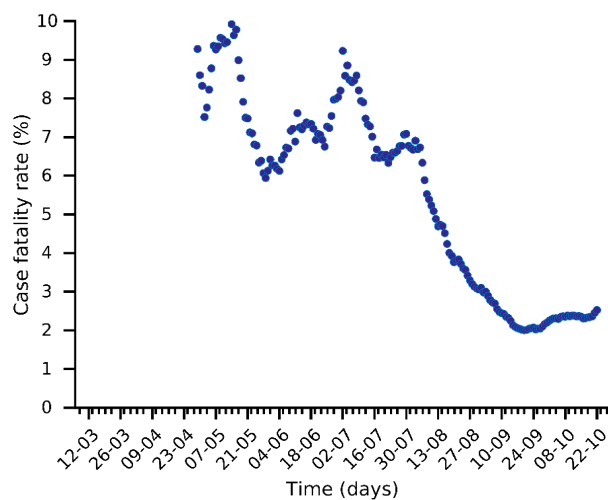
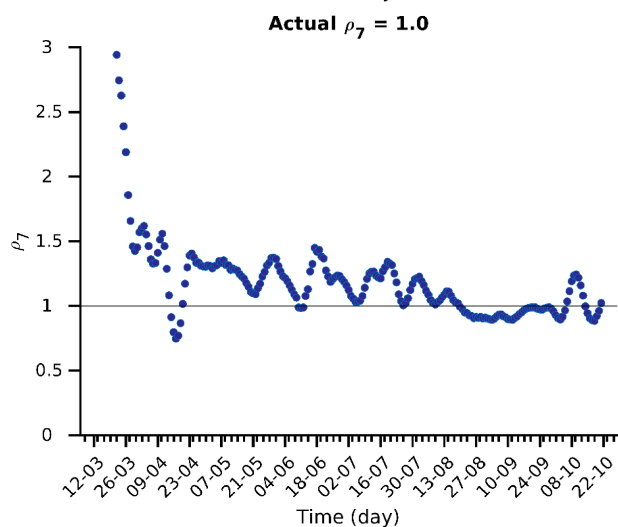
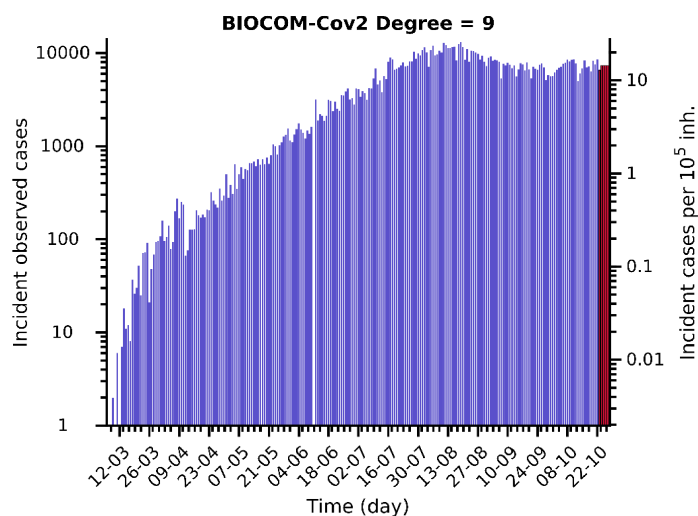
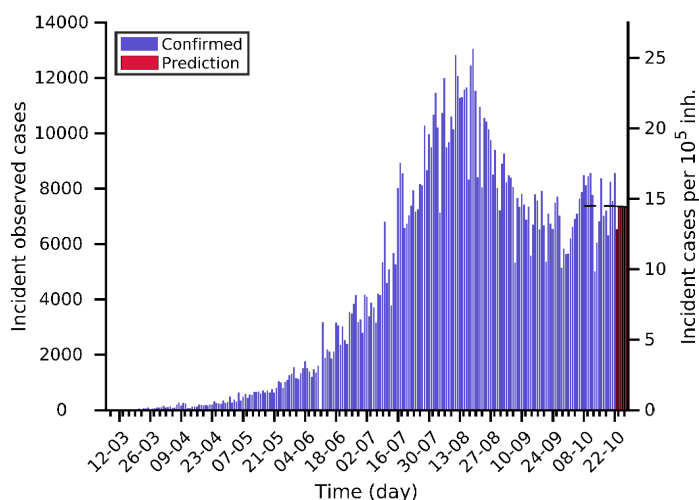


Predictions for next days

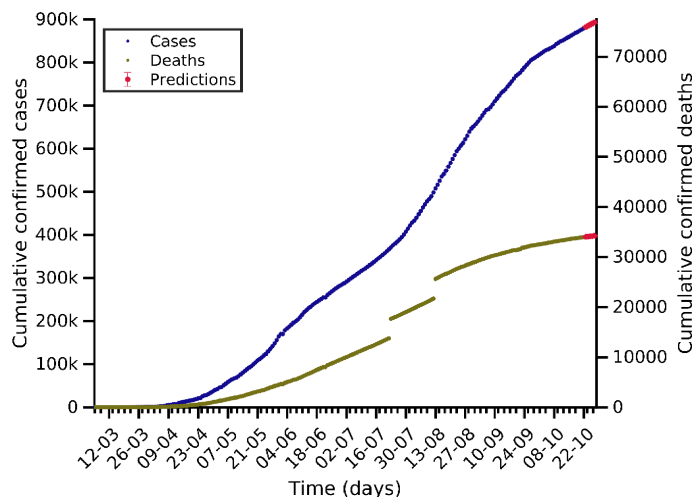
Day	Number of cases	95% Confidence Interval
23-10-2020	996793 (+6523)	[ 990270 - 1006914 ]
25-10-2020	1011504 (+7353)	[ 1000983 - 1022025 ]
27-10-2020	1026196 (+7343)	[ 1014818 - 1037573 ]

Current indicators

A <sub>14</sub>	EPG	CFR
205	209	2.52 %



# Peru 22-10-2020. Pop: 33.0M. Cumulative incidence: 2669/10<sup>5</sup>

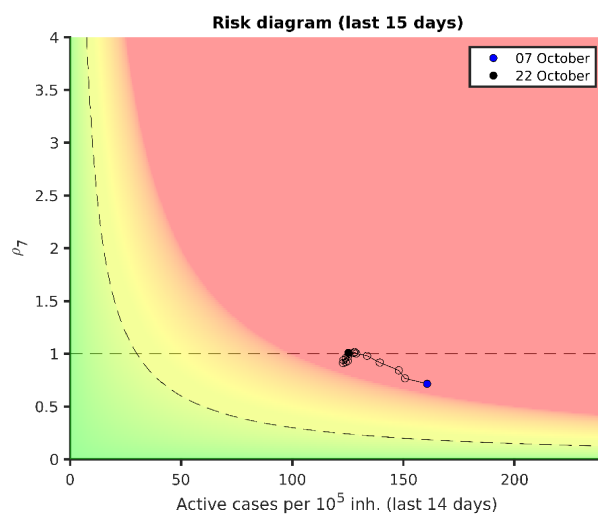
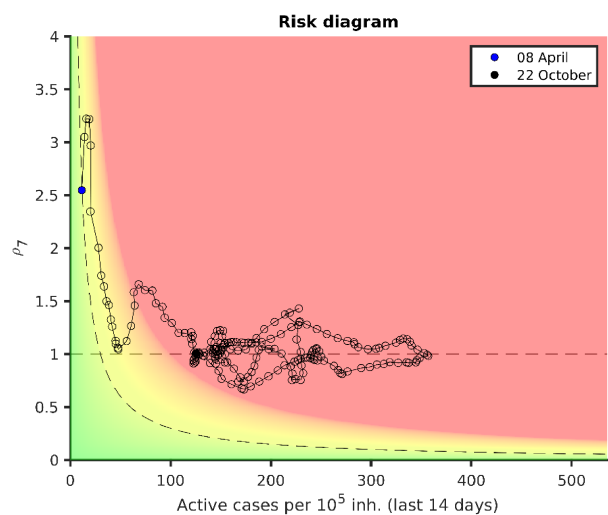
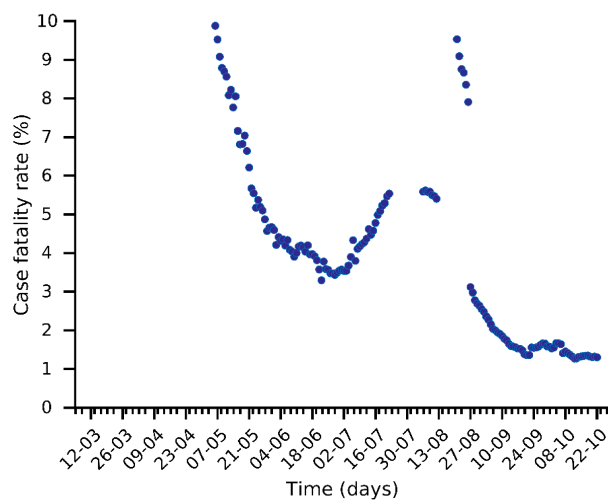
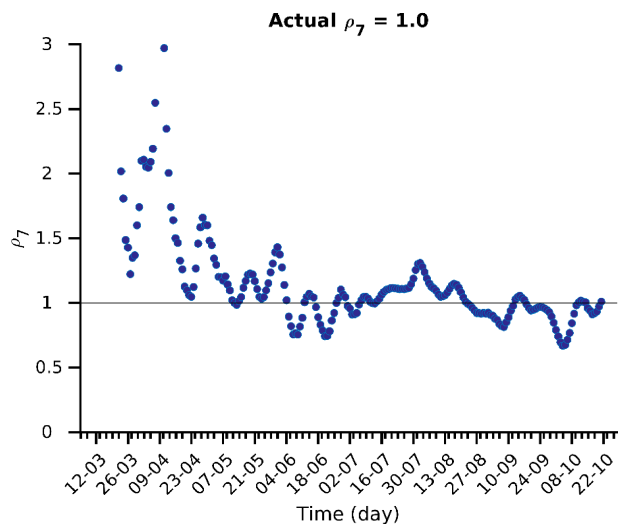
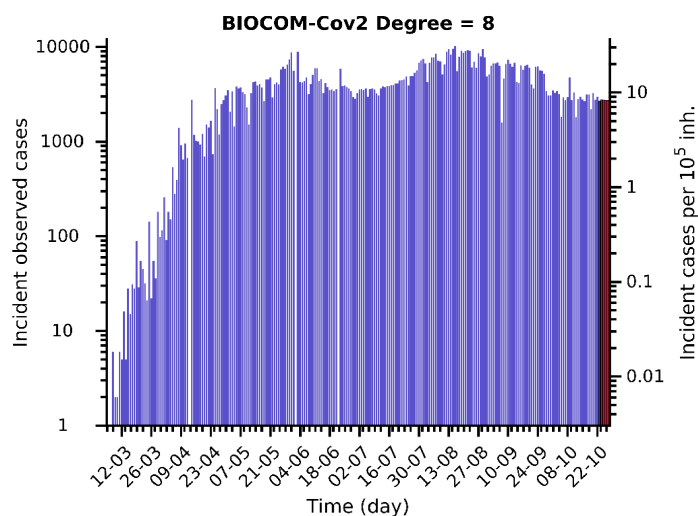
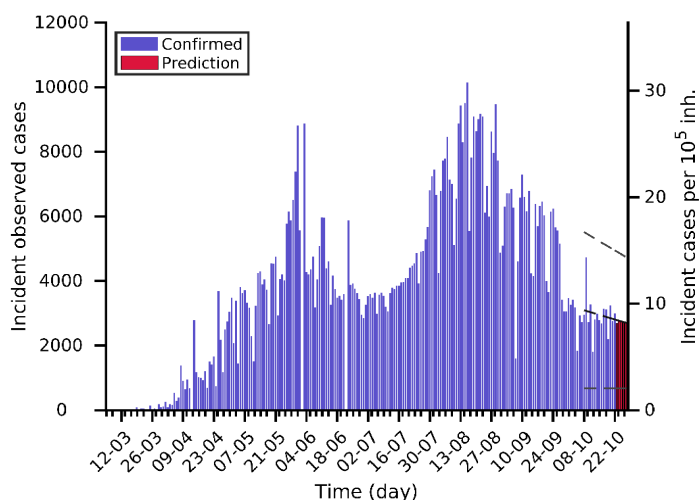


Predictions for next days

Day	Number of cases	95% Confidence Interval
23-10-2020	882569 (+2693)	[ 879980 - 885159 ]
25-10-2020	888088 (+2749)	[ 885402 - 890773 ]
27-10-2020	893527 (+2710)	[ 890642 - 896411 ]

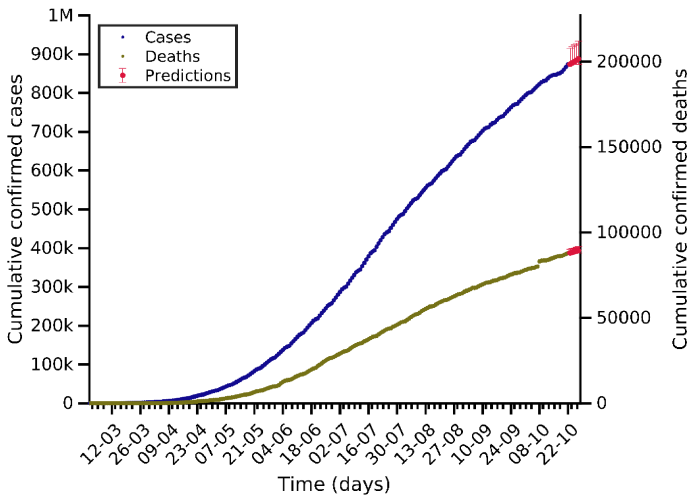
Current indicators

A <sub>14</sub>	EPG	CFR
125	126	1.30 %



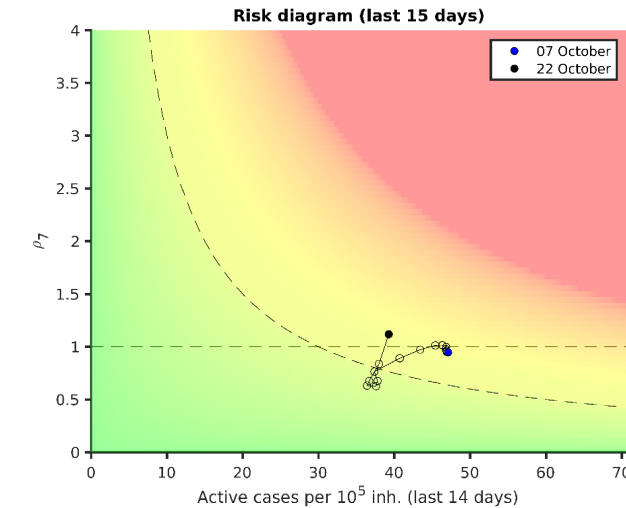
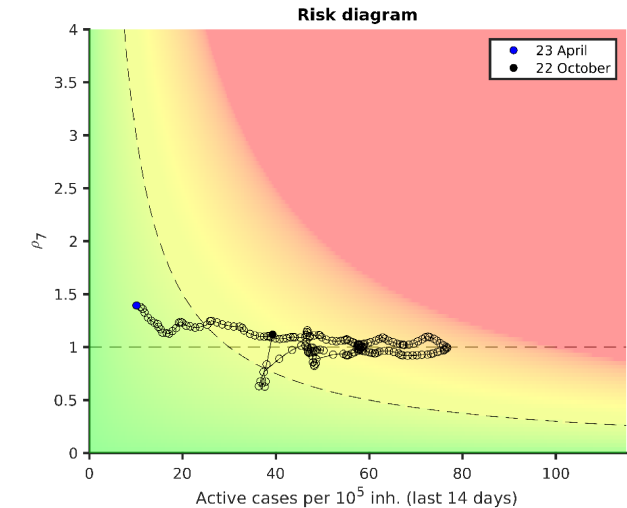
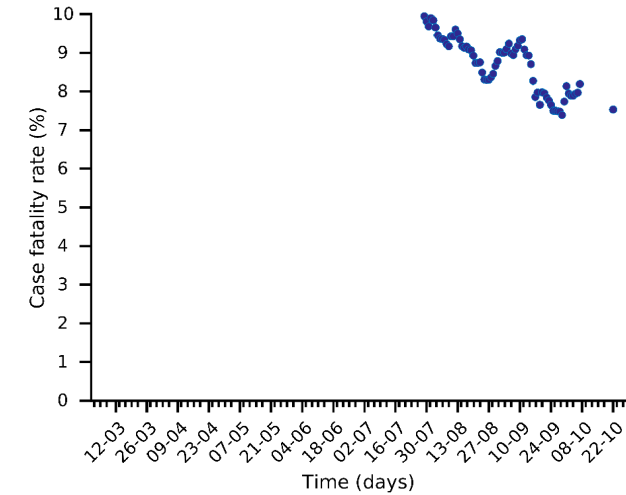
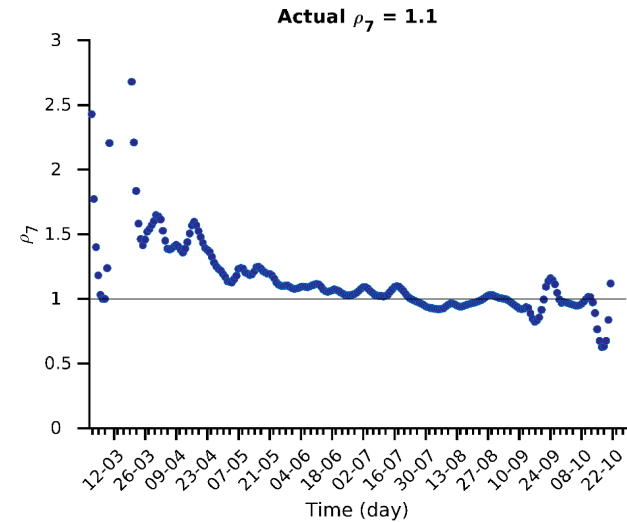
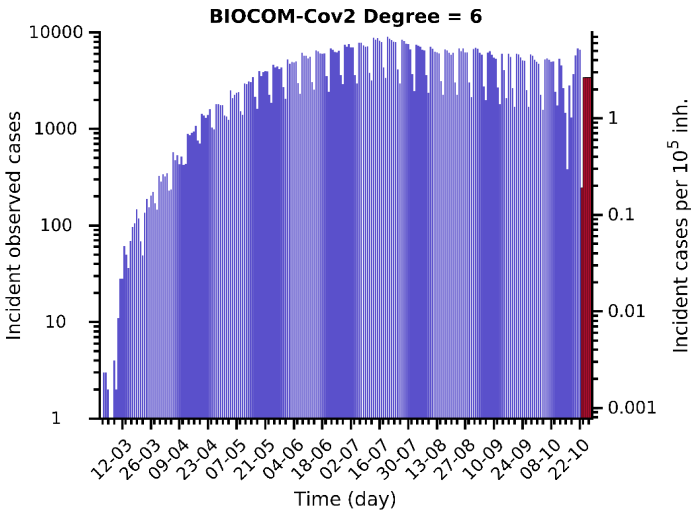
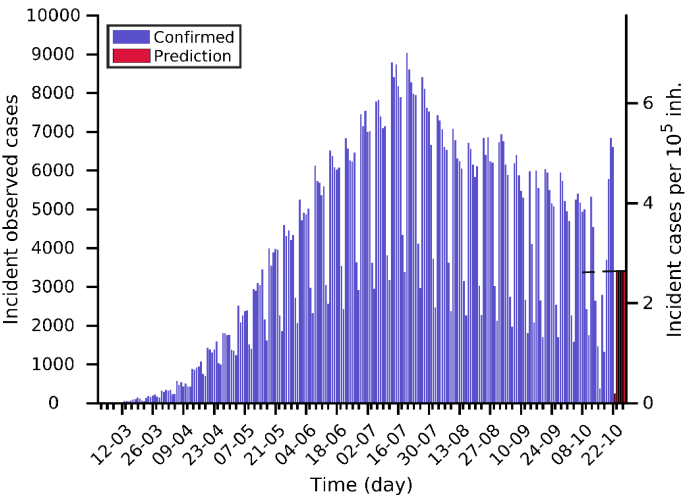


Mexico 22-10-2020. Pop: 128.9M. Cumulative incidence: 678/10<sup>5</sup>

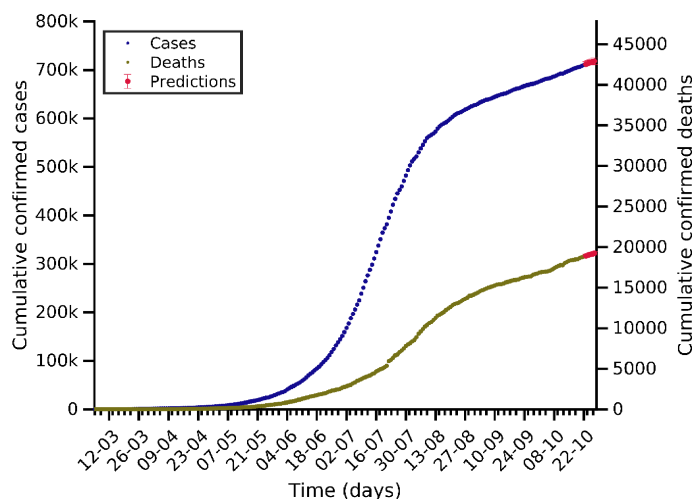


Predictions for next days		
Day	Number of cases	95% Confidence Interval
23-10-2020	874417 (+246)	[ 874171 - 915218 ]
25-10-2020	881234 (+3410)	[ 874171 - 923638 ]
27-10-2020	888058 (+3413)	[ 874171 - 933891 ]

Current indicators		
A <sub>14</sub>	EPG	CFR
39	44	7.53 %



# South Africa 22-10-2020. Pop: 59.3M. Cumulative incidence: 1198/10<sup>5</sup>

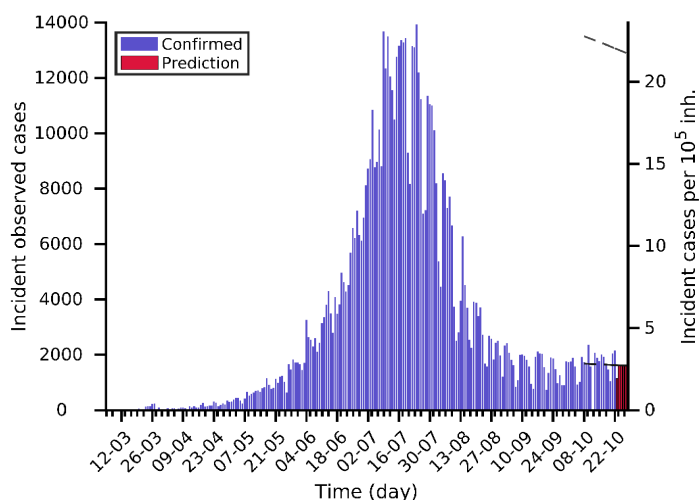


Predictions for next days

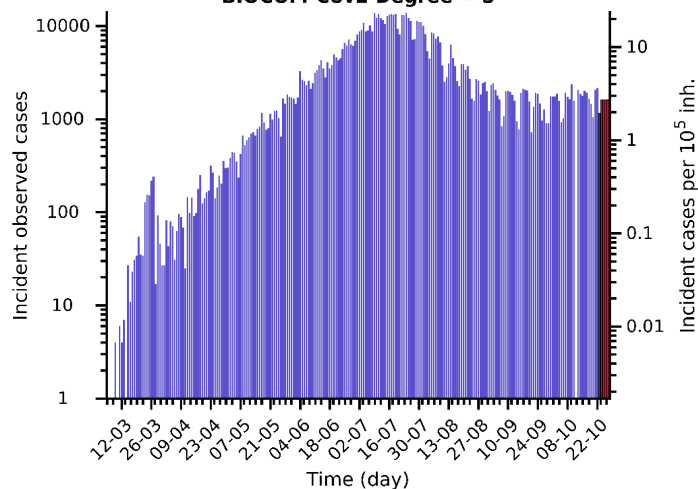
Day	Number of cases	95% Confidence Interval
23-10-2020	711664 (+1149)	[ 710515 - 717542 ]
25-10-2020	714902 (+1617)	[ 710515 - 721004 ]
27-10-2020	718124 (+1609)	[ 711547 - 724701 ]

Current indicators

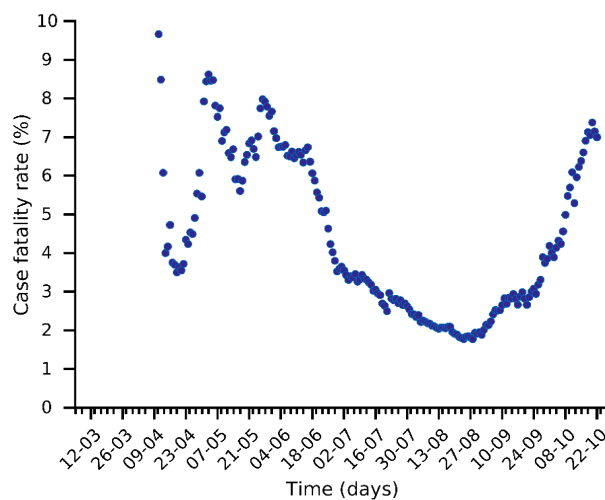
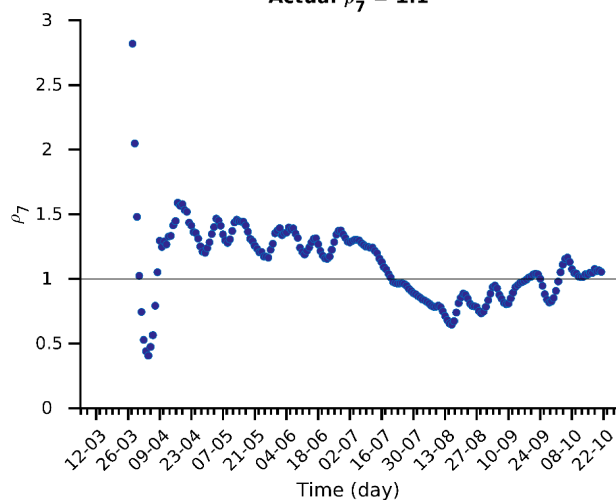
A <sub>14</sub>	EPG	CFR
40	42	7.00 %



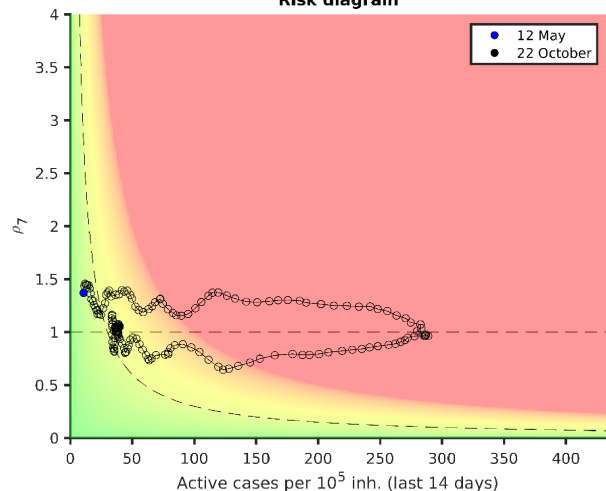
BIOCOM-Cov2 Degree = 5



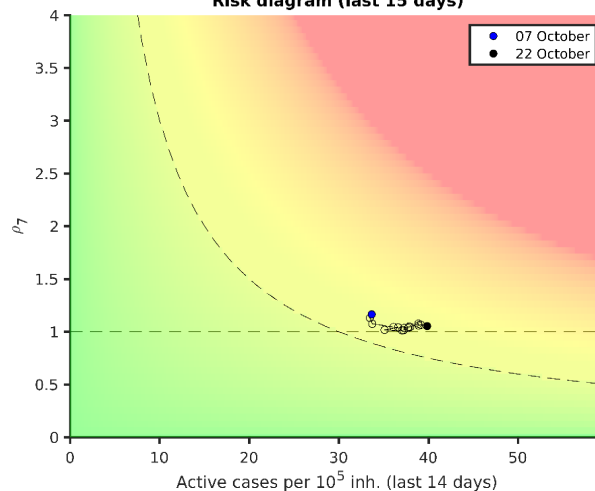
Actual  $\rho_7 = 1.1$



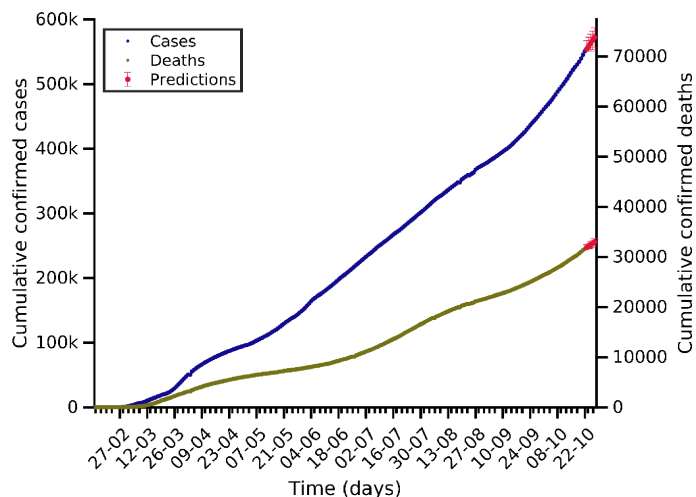
Risk diagram



Risk diagram (last 15 days)



# Iran 22-10-2020. Pop: 84.0M. Cumulative incidence: 656/10<sup>5</sup>

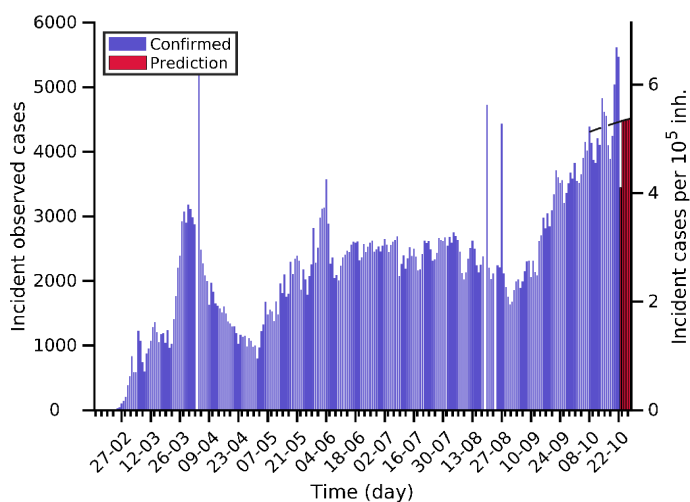


Predictions for next days

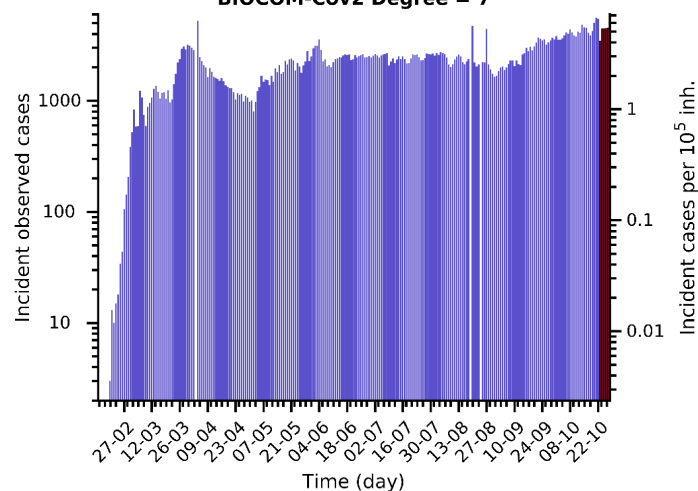
Day	Number of cases	95% Confidence Interval
23-10-2020	554202 (+3445)	[ 550757 - 567618 ]
25-10-2020	563172 (+4490)	[ 550757 - 577131 ]
27-10-2020	572178 (+4508)	[ 557047 - 587310 ]

Current indicators

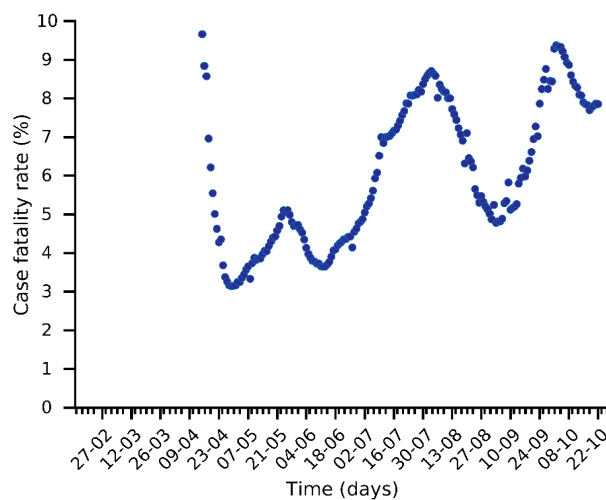
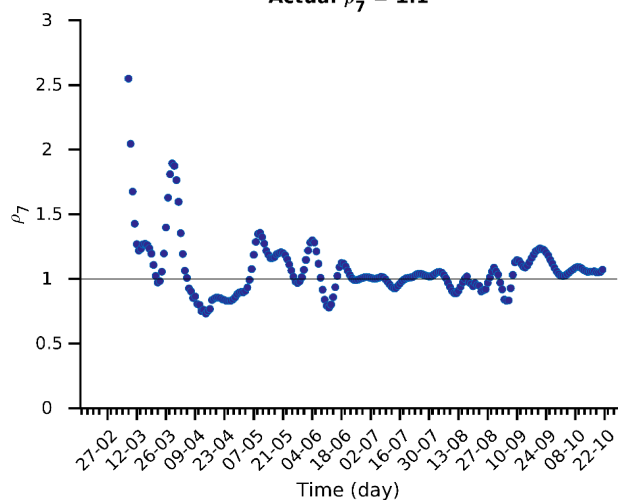
A <sub>14</sub>	EPG	CFR
74	80	7.85 %



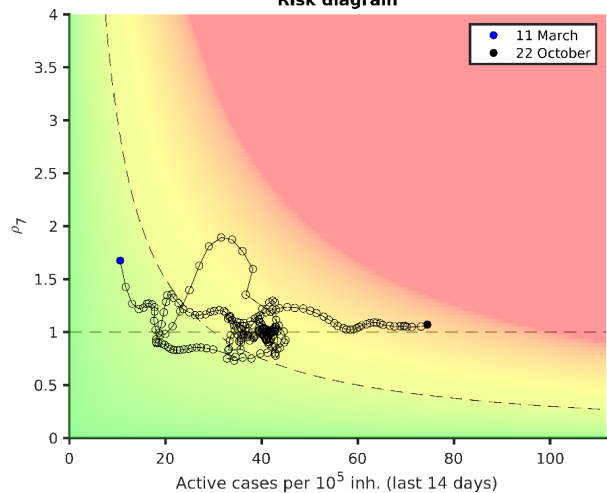
BIOCOM-Cov2 Degree = 7



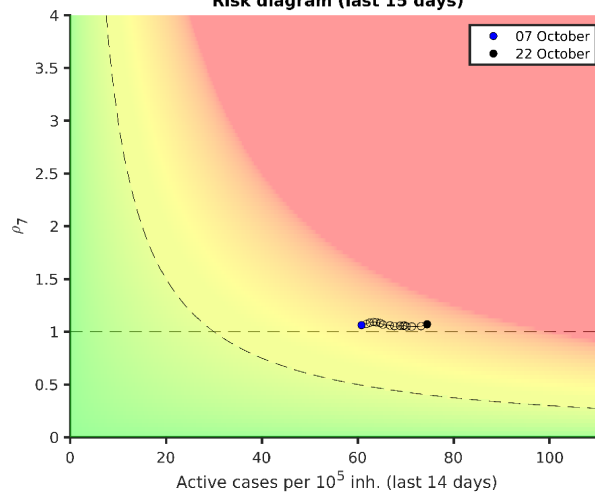
Actual  $\rho_7 = 1.1$



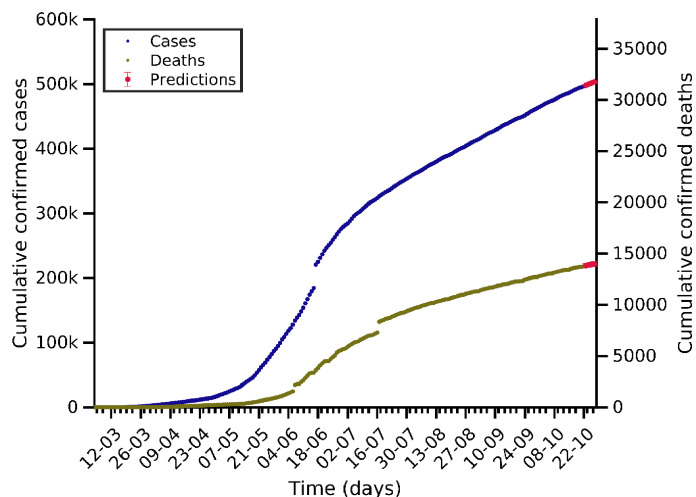
Risk diagram



Risk diagram (last 15 days)



# Chile 22-10-2020. Pop: 19.1M. Cumulative incidence: 2601/10<sup>5</sup>

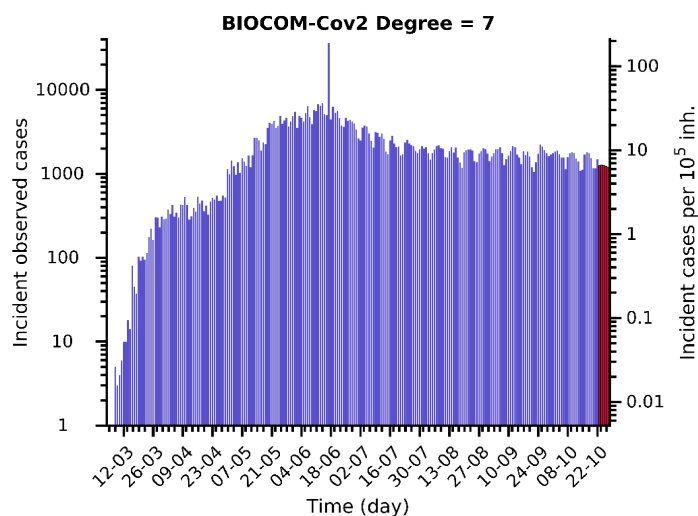
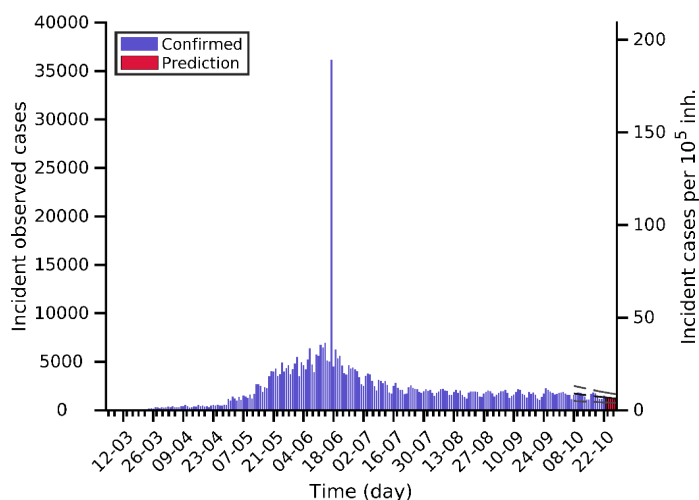


Predictions for next days

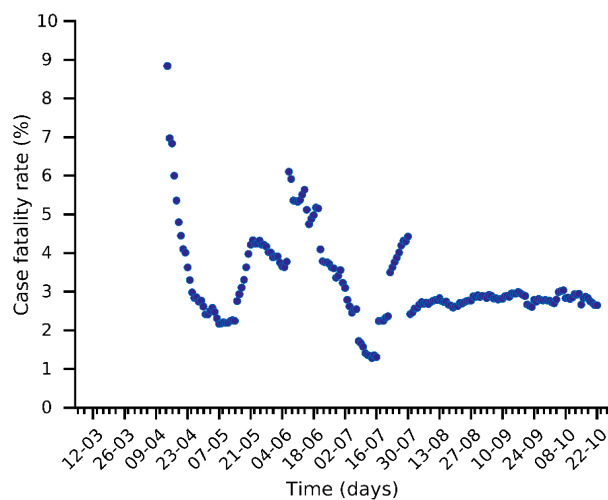
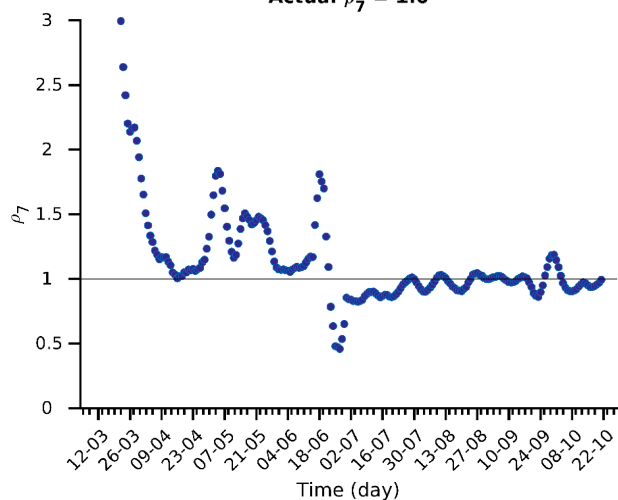
Day	Number of cases	95% Confidence Interval
23-10-2020	498390 (+1259)	[ 497131 - 499987 ]
25-10-2020	500927 (+1256)	[ 499276 - 502577 ]
27-10-2020	503369 (+1209)	[ 501610 - 505127 ]

Current indicators

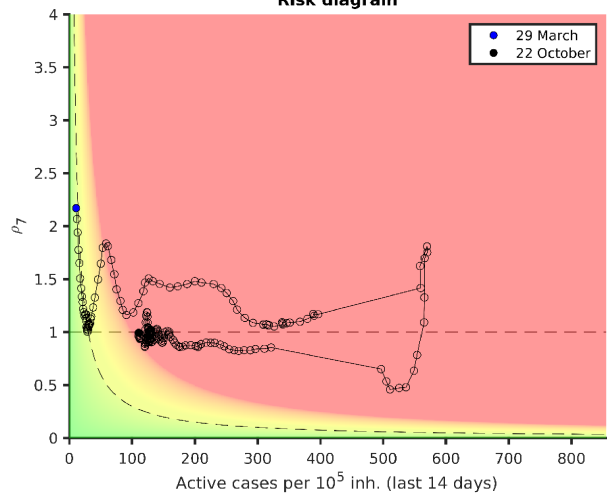
A <sub>14</sub>	EPG	CFR
110	110	2.65 %



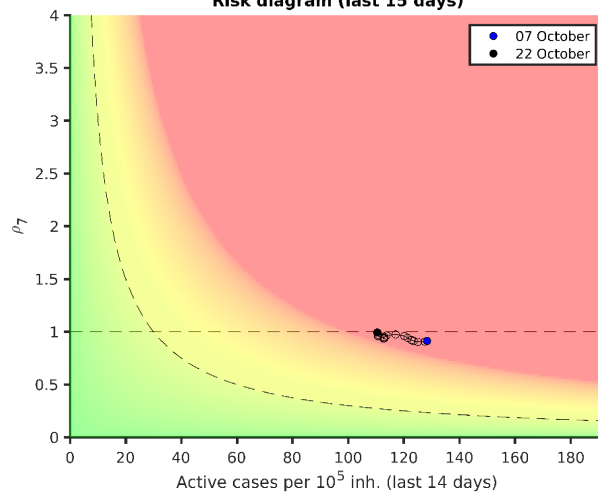
Actual  $\rho_7 = 1.0$



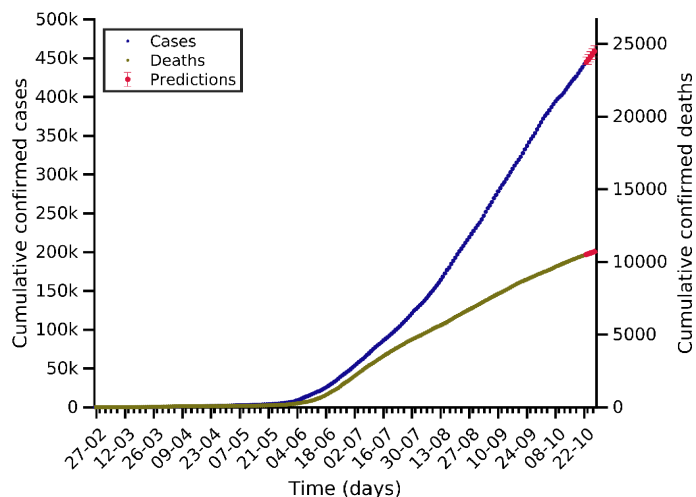
Risk diagram



Risk diagram (last 15 days)



# Iraq 22-10-2020. Pop: 40.2M. Cumulative incidence: 1099/10<sup>5</sup>

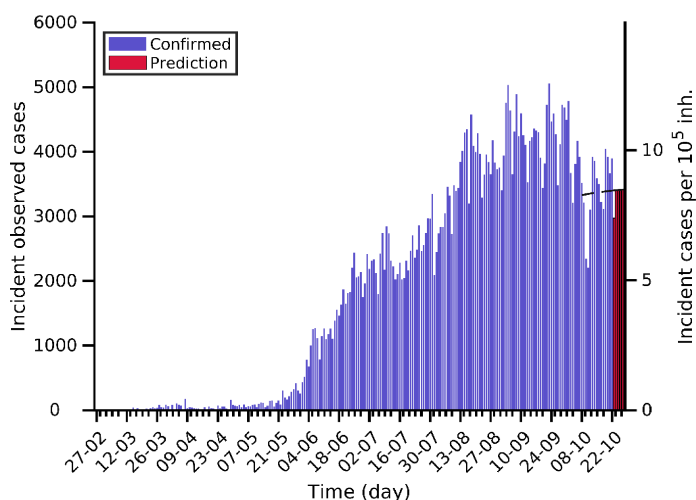


Predictions for next days

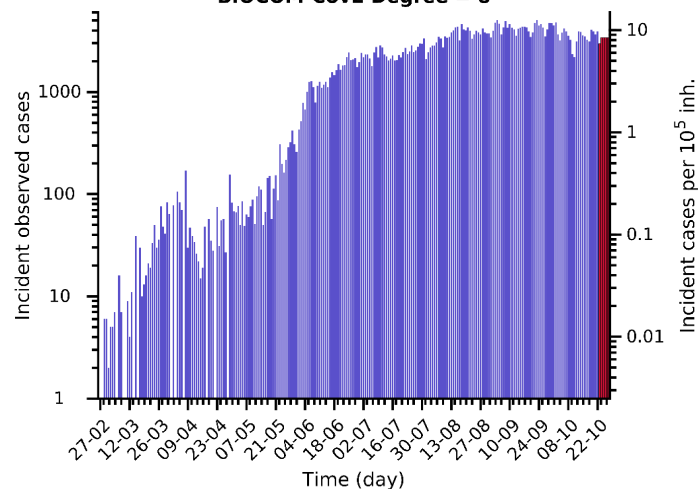
Day	Number of cases	95% Confidence Interval
23-10-2020	445135 (+2971)	[ 442164 - 451500 ]
25-10-2020	451949 (+3408)	[ 445329 - 458569 ]
27-10-2020	458775 (+3415)	[ 451607 - 465943 ]

Current indicators

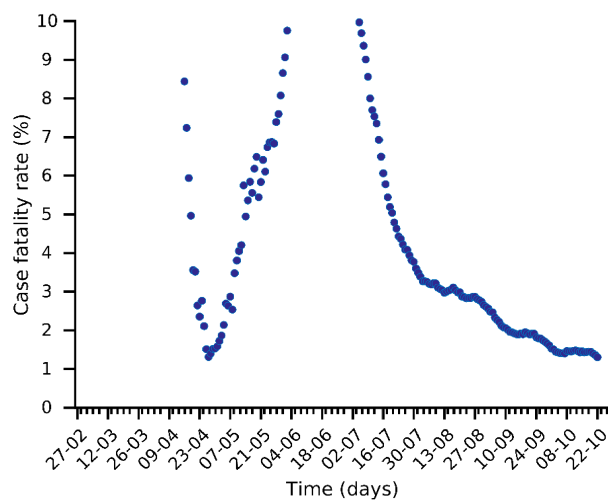
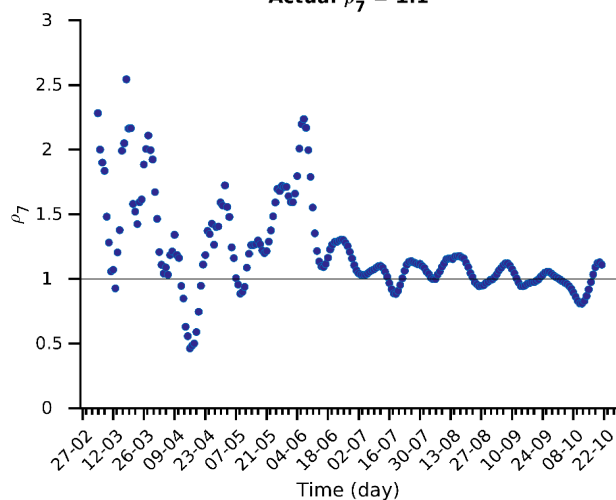
A <sub>14</sub>	EPG	CFR
118	131	1.30 %



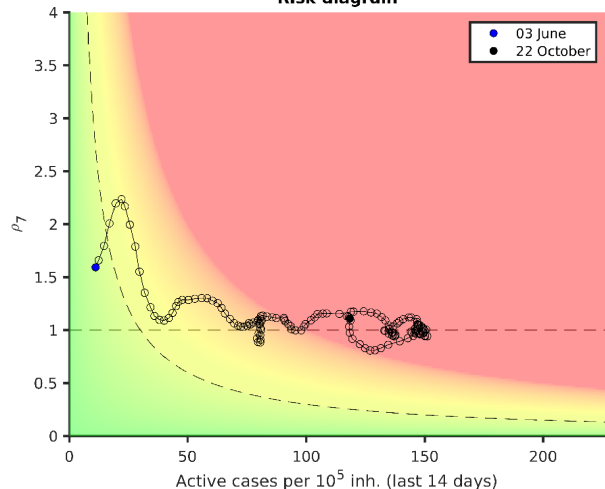
BIOCOM-Cov2 Degree = 8



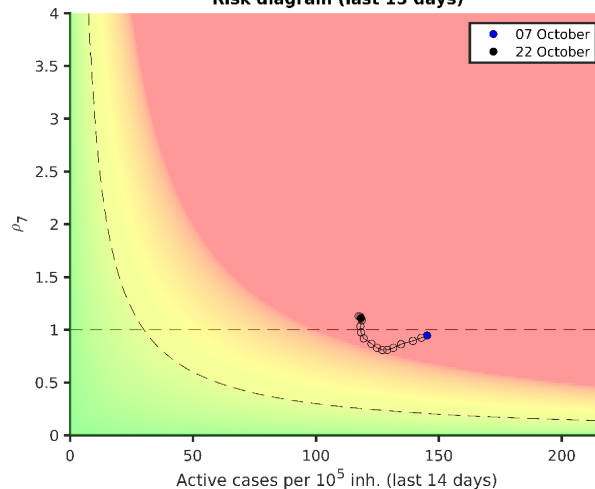
Actual  $\rho_7 = 1.1$



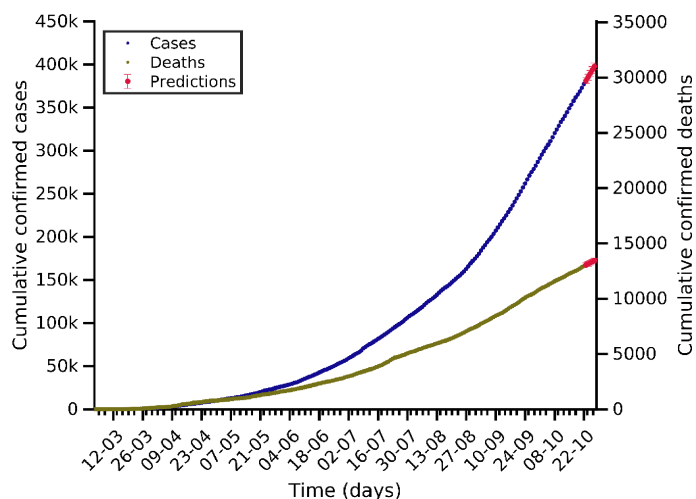
Risk diagram



Risk diagram (last 15 days)



# Indonesia 22-10-2020. Pop: 273.5M. Cumulative incidence: 138/10<sup>5</sup>

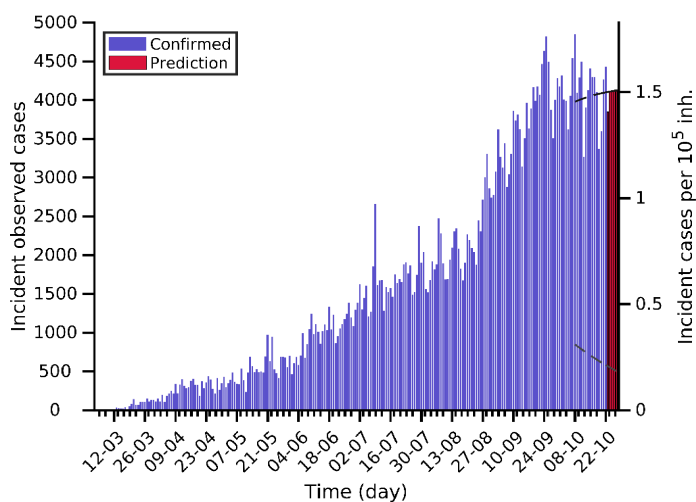


Predictions for next days

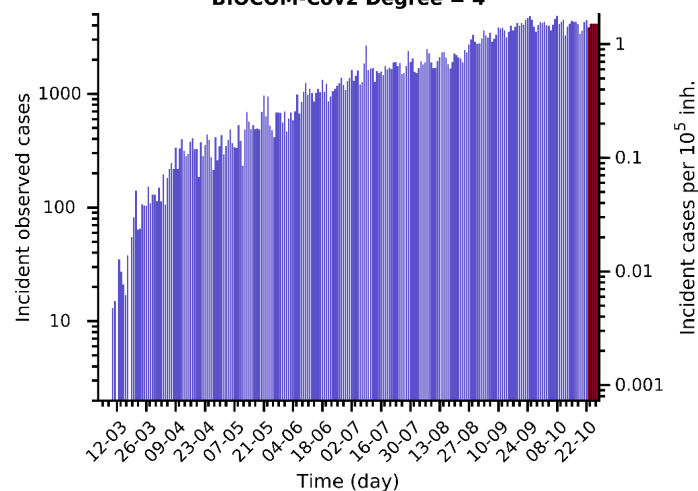
Day	Number of cases	95% Confidence Interval
23-10-2020	381389 (+3848)	[ 377941 - 384837 ]
25-10-2020	389616 (+4116)	[ 386028 - 393204 ]
27-10-2020	397861 (+4124)	[ 393970 - 401752 ]

Current indicators

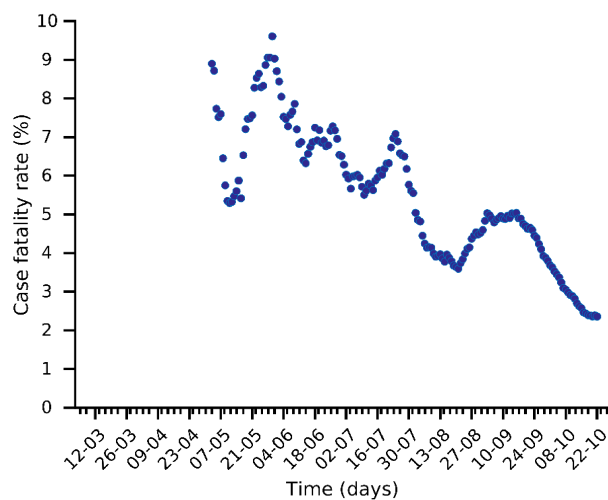
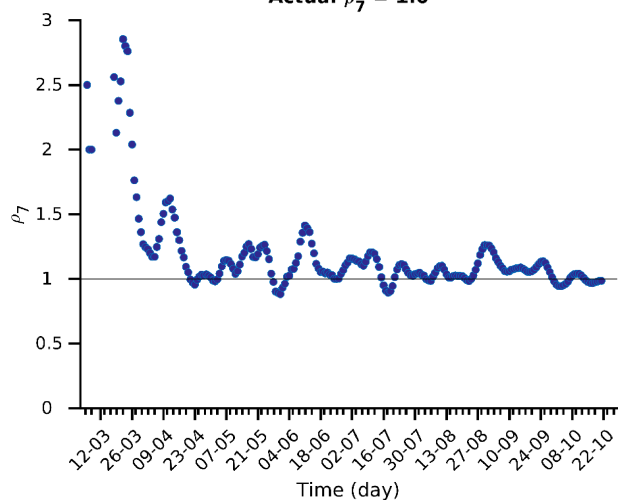
A <sub>14</sub>	EPG	CFR
21	21	2.36 %



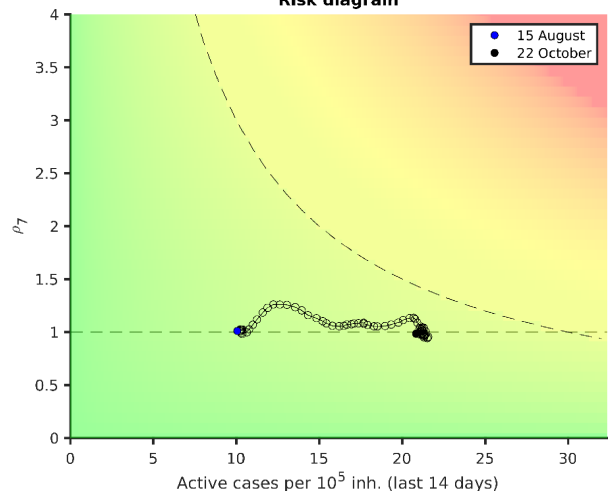
BIOCOM-Cov2 Degree = 4



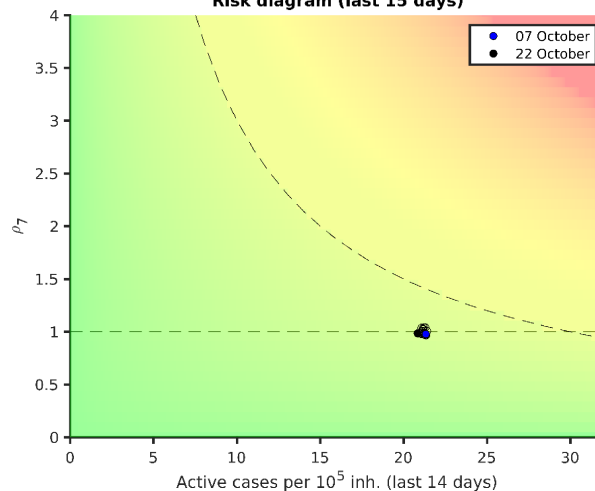
Actual  $\rho_7 = 1.0$



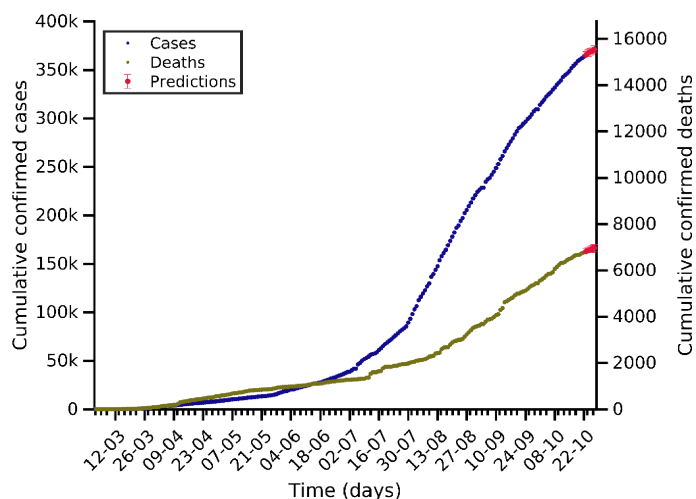
Risk diagram



Risk diagram (last 15 days)



# Philippines 22-10-2020. Pop: 109.6M. Cumulative incidence: 332/10<sup>5</sup>

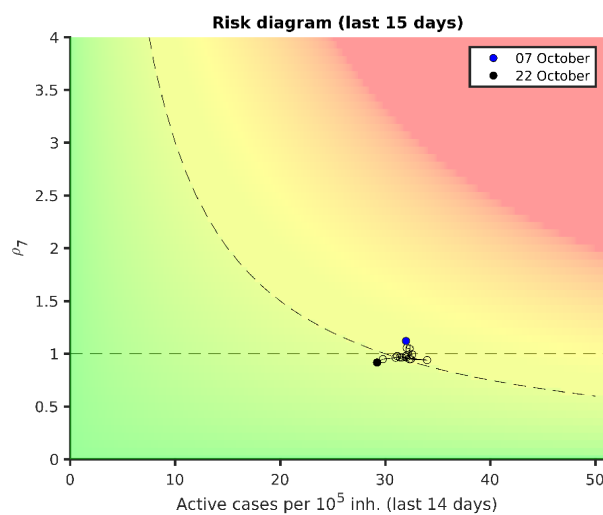
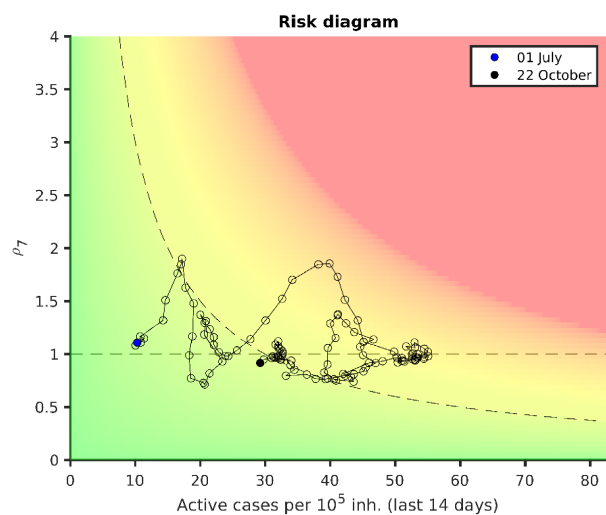
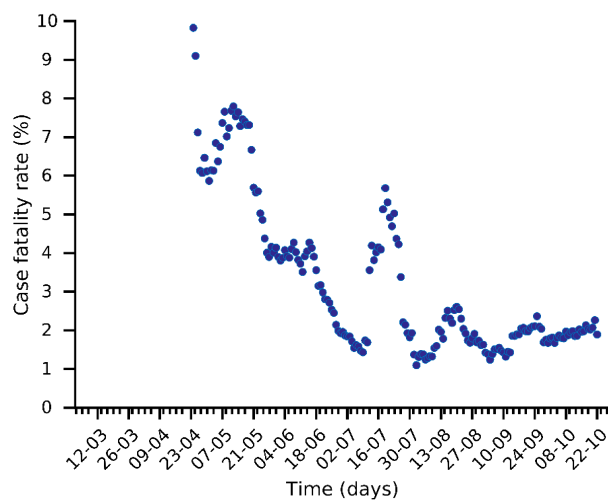
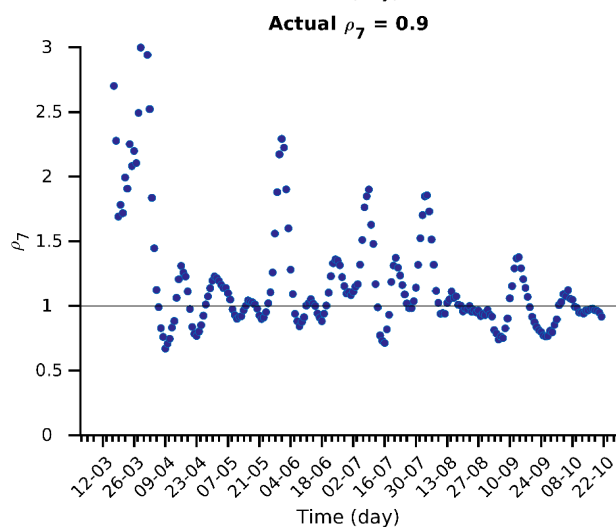
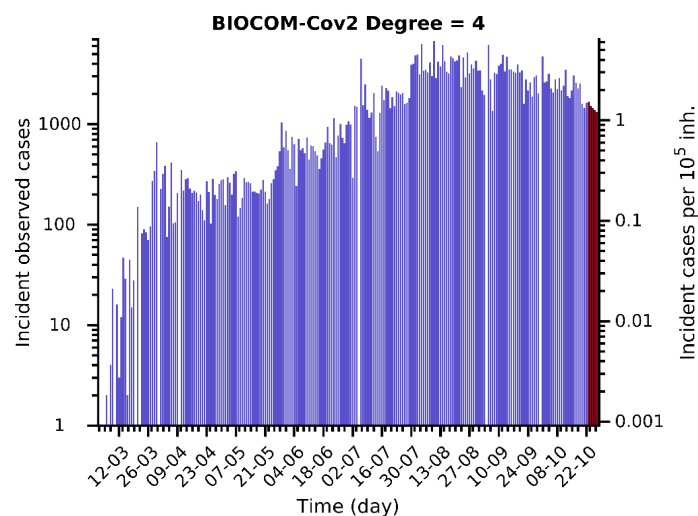
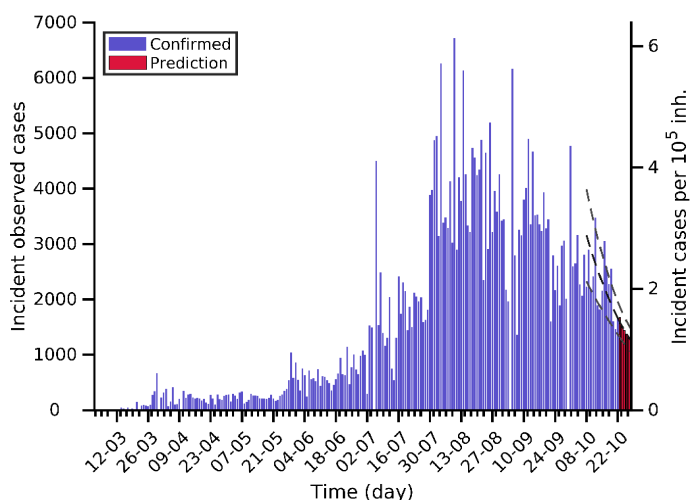


Predictions for next days

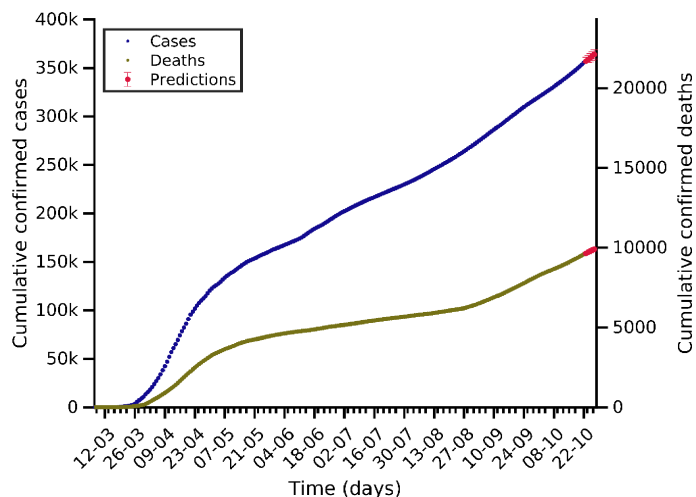
Day	Number of cases	95% Confidence Interval
23-10-2020	365562 (+1674)	[ 363888 - 368970 ]
25-10-2020	368514 (+1440)	[ 365015 - 372014 ]
27-10-2020	371192 (+1306)	[ 367524 - 374860 ]

Current indicators

A <sub>14</sub>	EPG	CFR
29	27	1.89 %



# Turkey 22-10-2020. Pop: 84.3M. Cumulative incidence: 422/10<sup>5</sup>

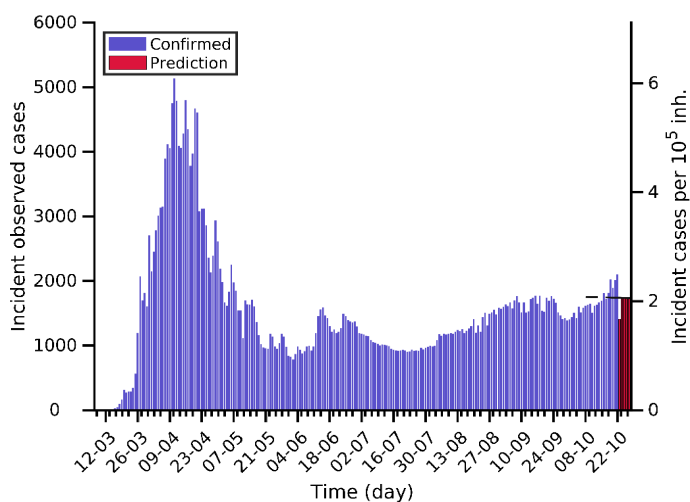


Predictions for next days

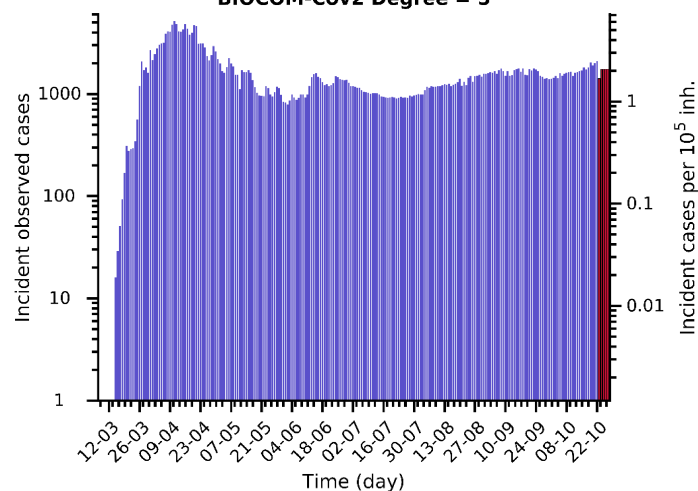
Day	Number of cases	95% Confidence Interval
23-10-2020	356938 (+1410)	[ 355528 - 361142 ]
25-10-2020	360412 (+1737)	[ 356043 - 364781 ]
27-10-2020	363882 (+1734)	[ 359162 - 368601 ]

Current indicators

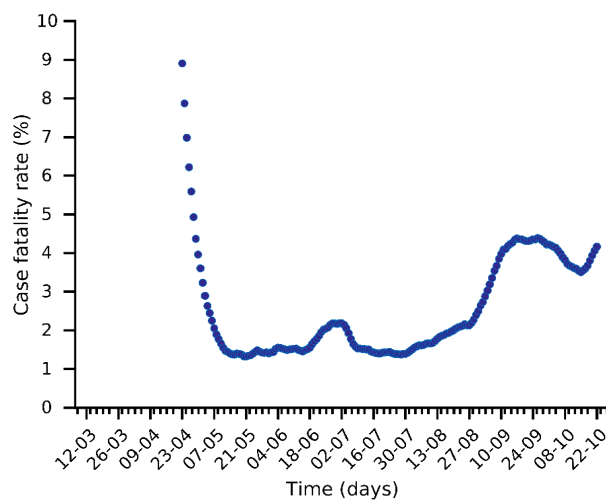
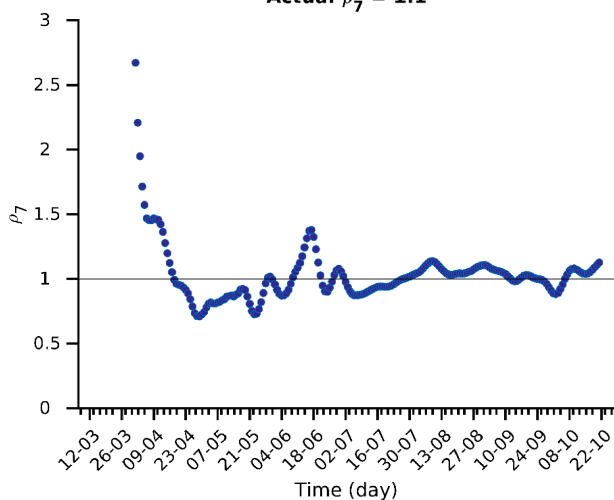
A <sub>14</sub>	EPG	CFR
29	33	4.16 %



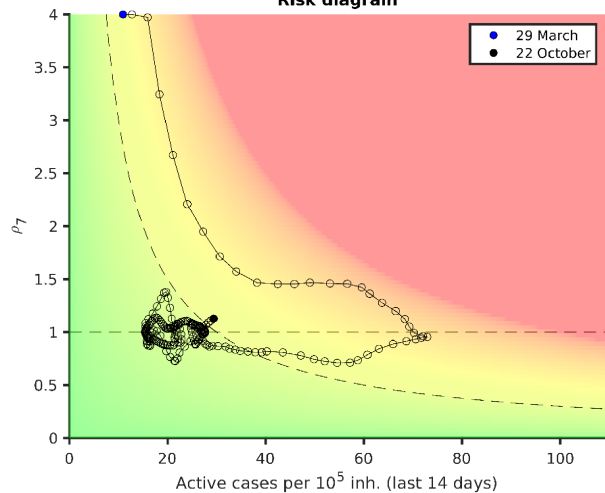
BIOCOM-Cov2 Degree = 5



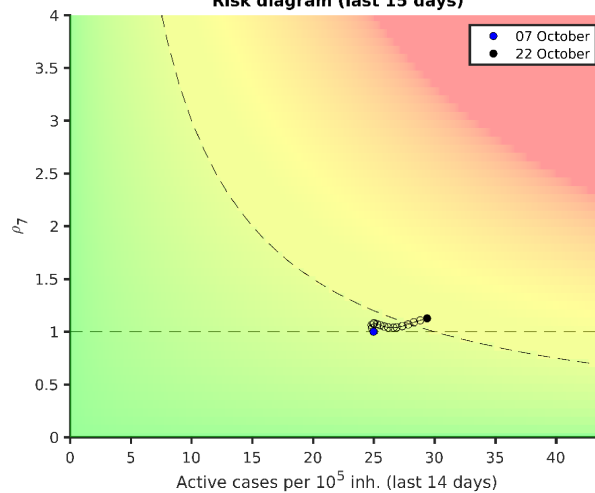
Actual  $\rho_7 = 1.1$



Risk diagram

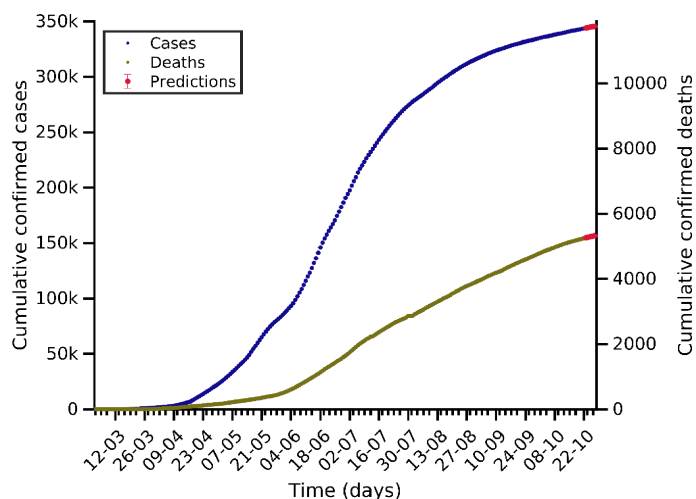


Risk diagram (last 15 days)





# Saudi Arabia 22-10-2020. Pop: 34.8M. Cumulative incidence: 987/10<sup>5</sup>

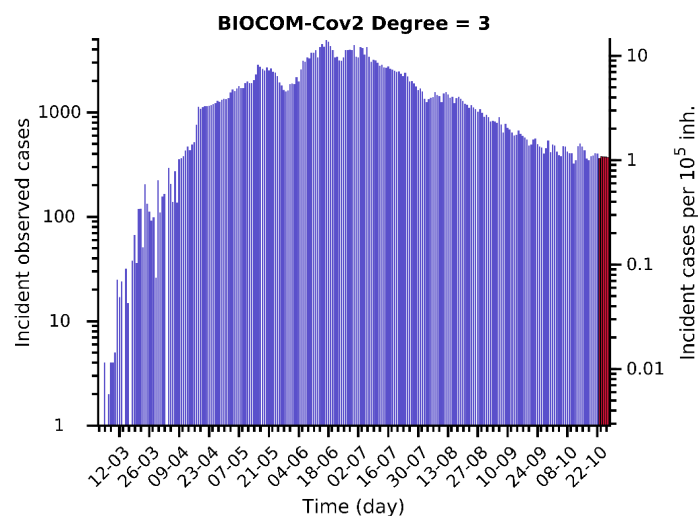
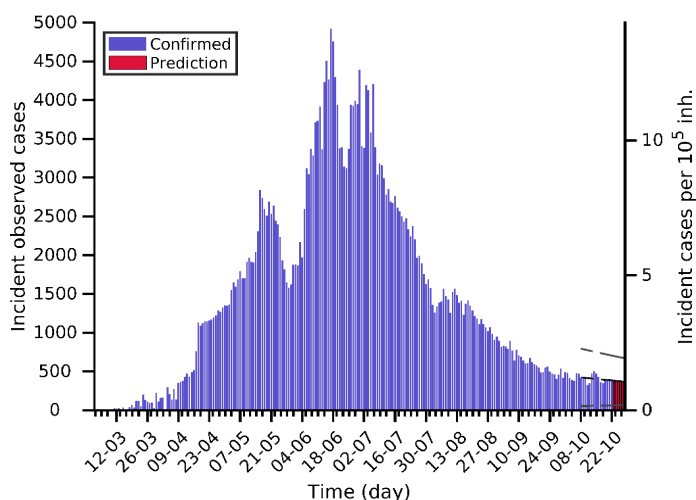


Predictions for next days

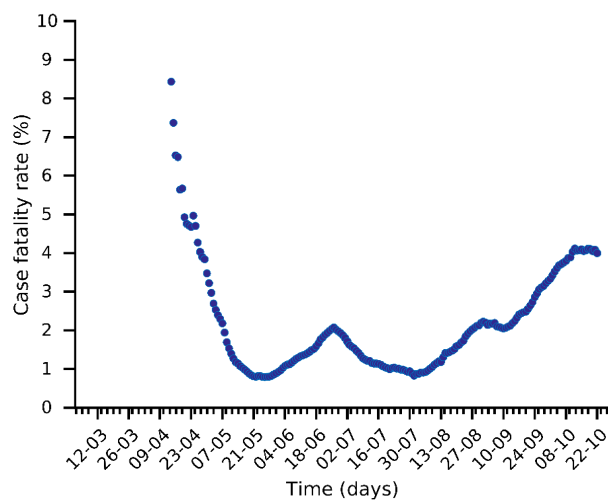
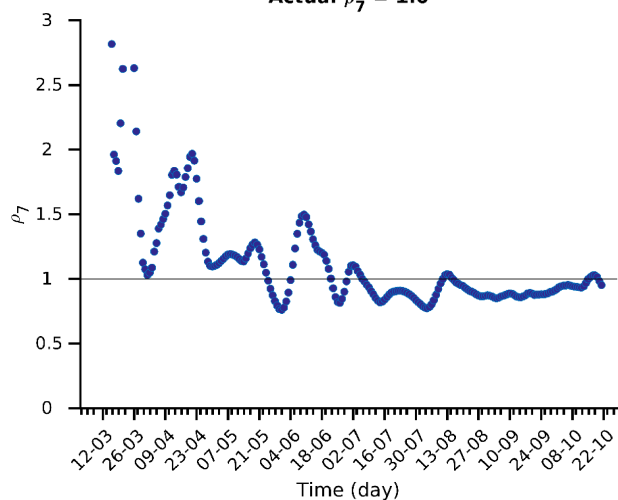
Day	Number of cases	95% Confidence Interval
23-10-2020	344137 (+363)	[ 343821 - 344453 ]
25-10-2020	344890 (+375)	[ 344562 - 345217 ]
27-10-2020	345632 (+370)	[ 345280 - 345983 ]

Current indicators

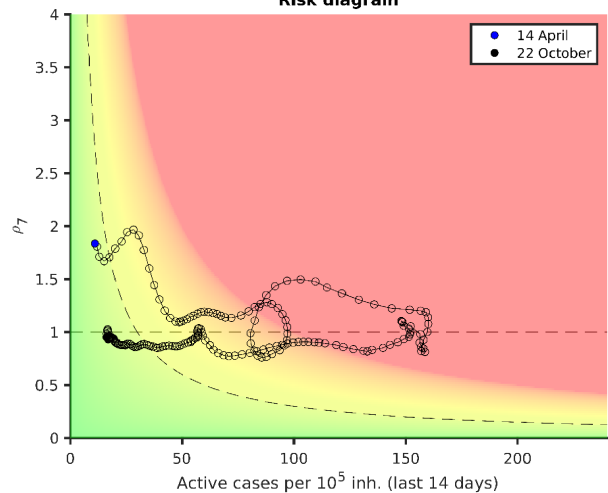
A <sub>14</sub>	EPG	CFR
16	15	4.00 %



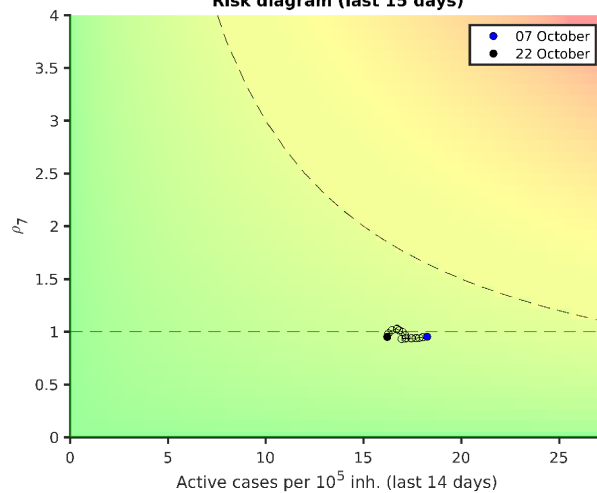
Actual  $\rho_7 = 1.0$



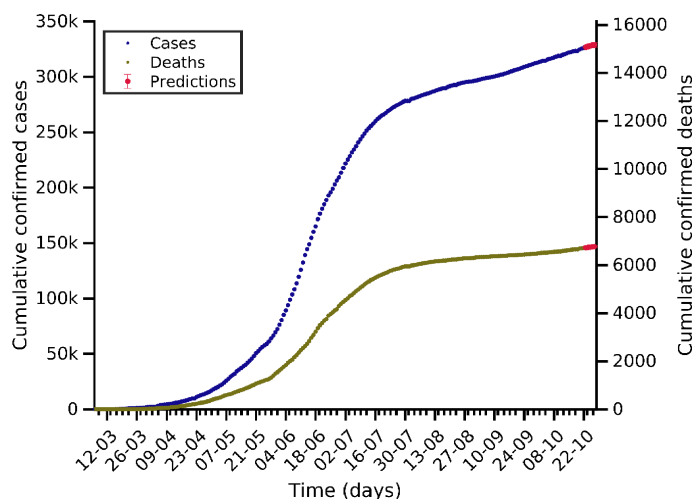
Risk diagram



Risk diagram (last 15 days)



# Pakistan 22-10-2020. Pop: 220.9M. Cumulative incidence: 148/10<sup>5</sup>

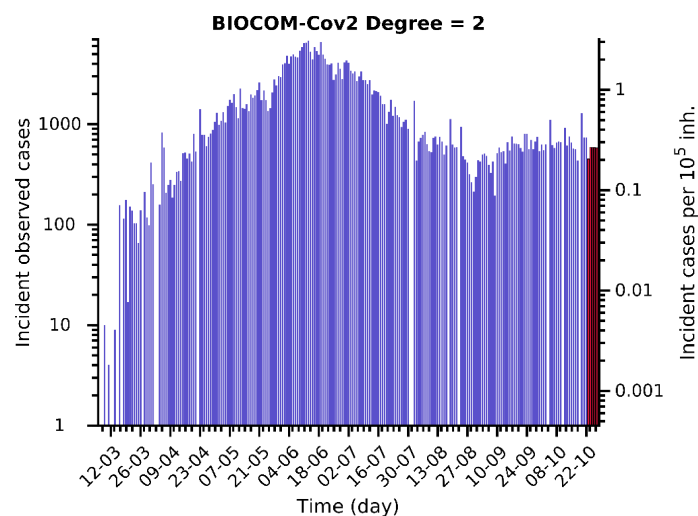
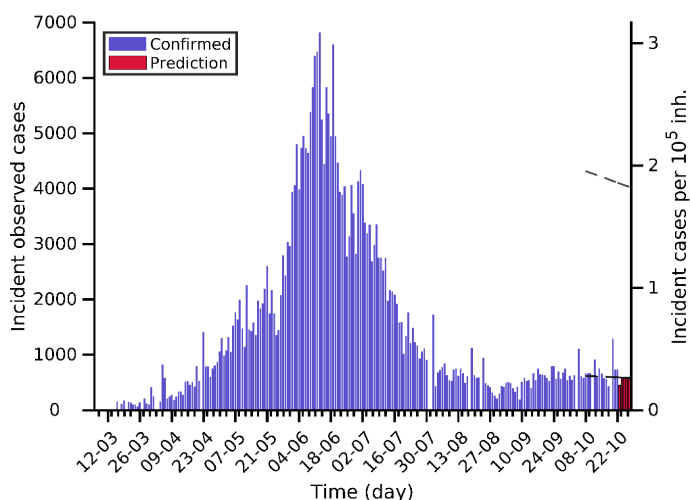


Predictions for next days

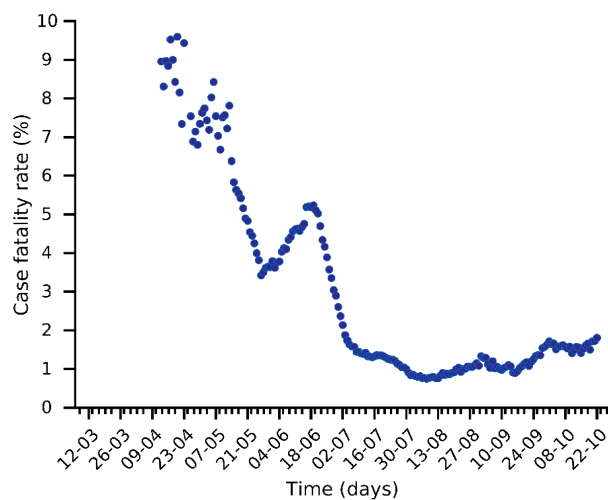
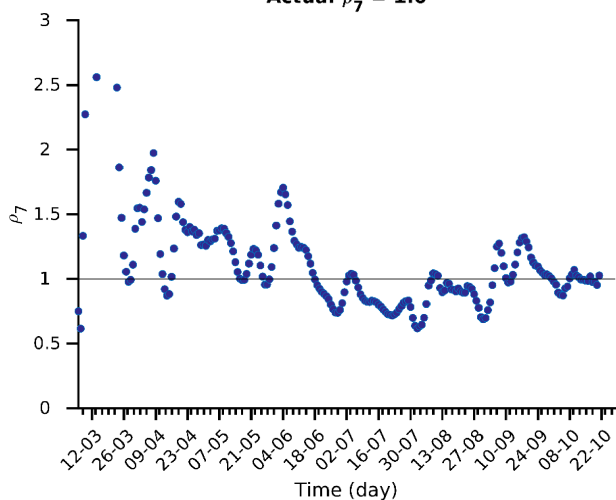
Day	Number of cases	95% Confidence Interval
23-10-2020	326665 (+449)	[ 326216 - 328575 ]
25-10-2020	327844 (+588)	[ 326216 - 329826 ]
27-10-2020	329015 (+585)	[ 326880 - 331150 ]

Current indicators

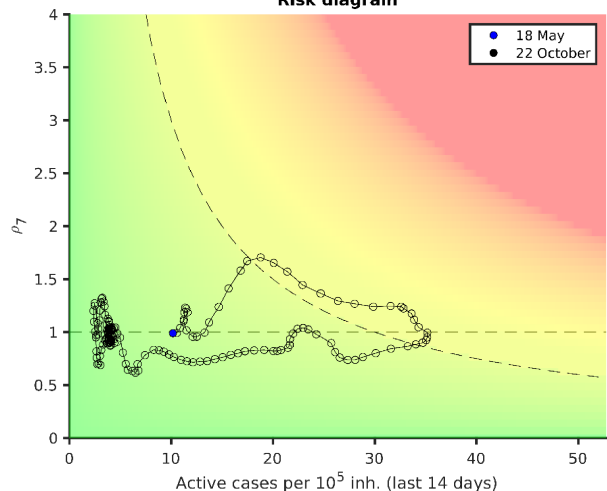
A <sub>14</sub>	EPG	CFR
4	4	1.80 %



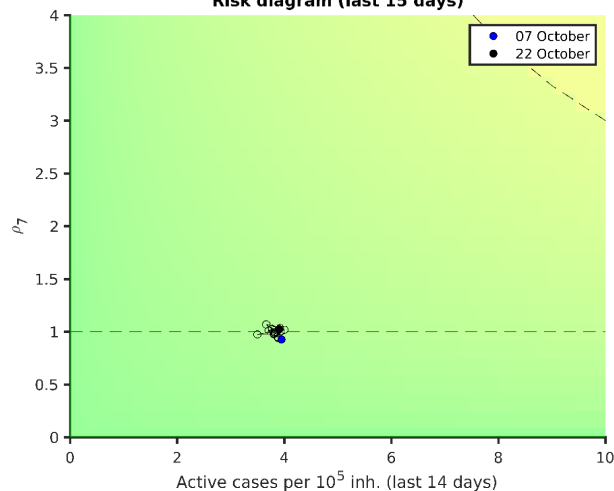
Actual  $\rho_7 = 1.0$



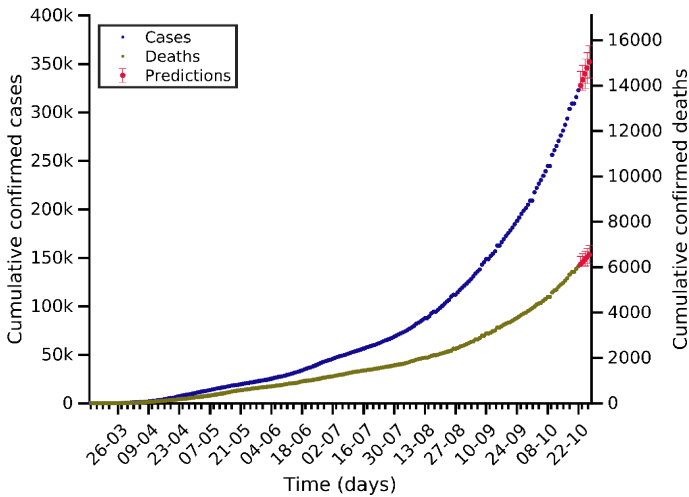
Risk diagram



Risk diagram (last 15 days)

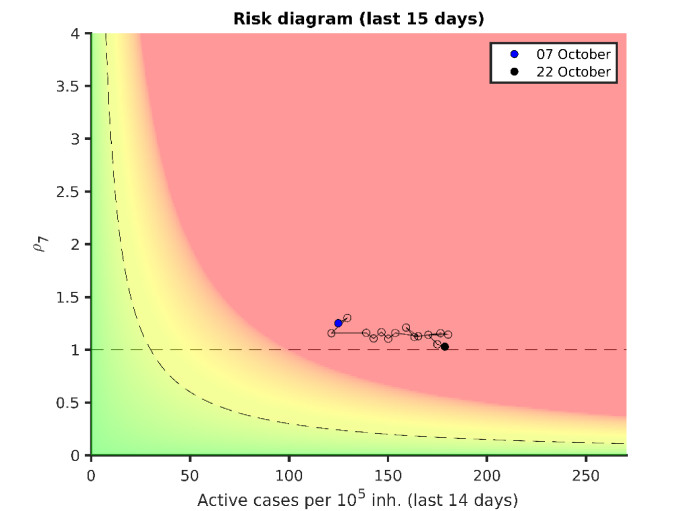
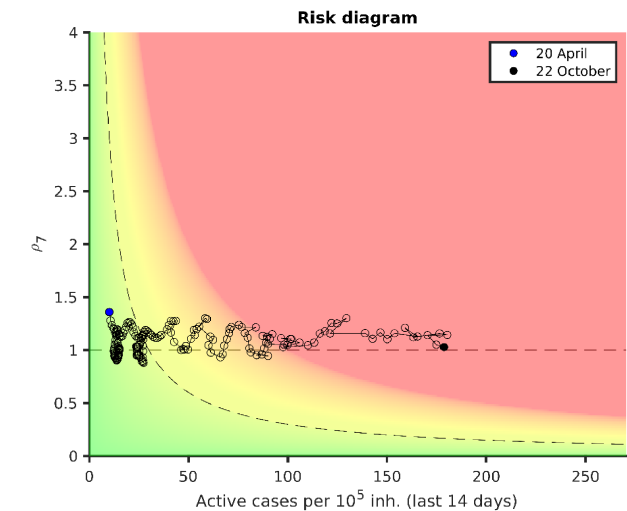
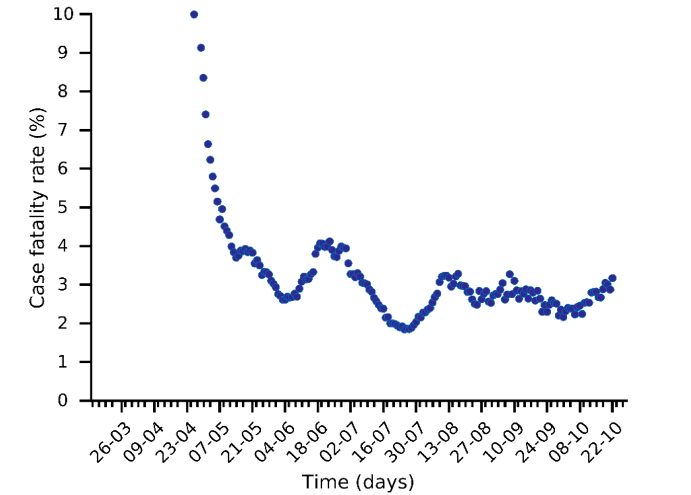
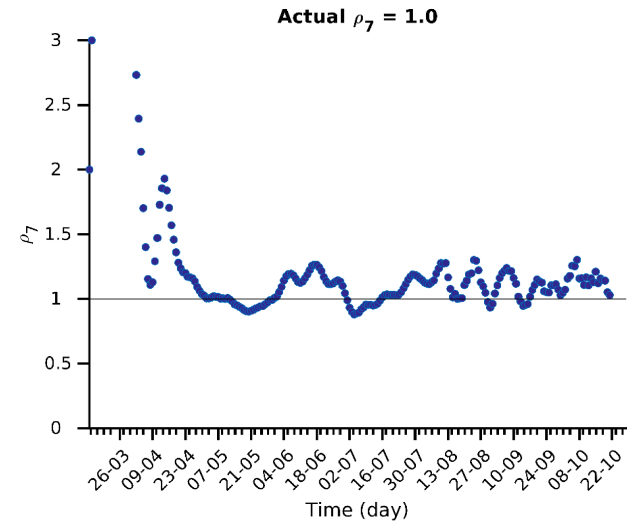
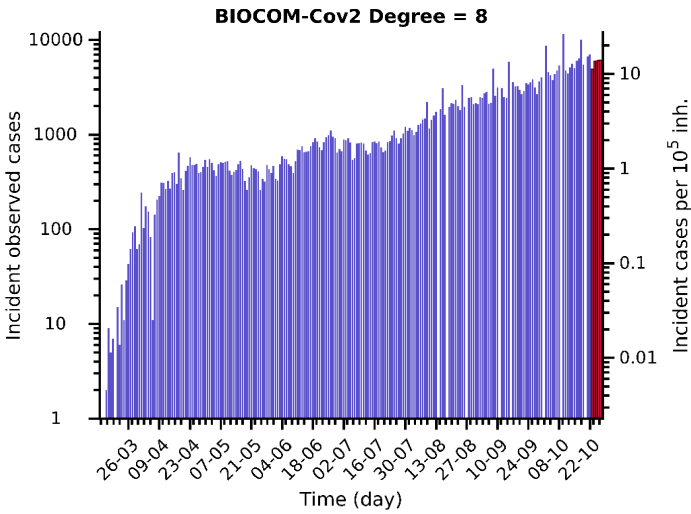
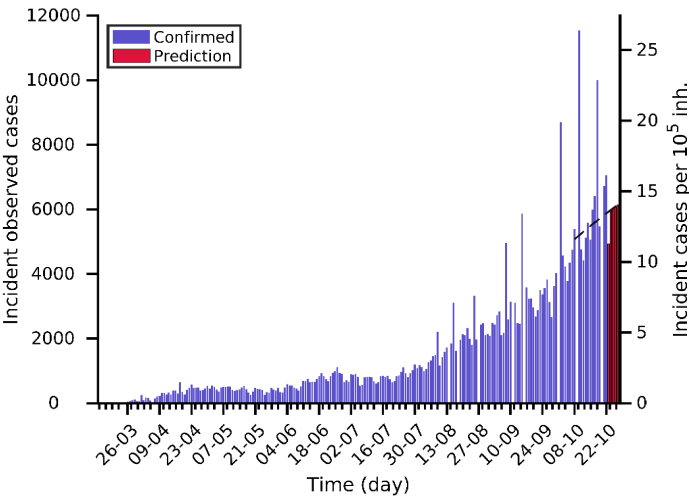


Ukraine 22-10-2020. Pop: 43.7M. Cumulative incidence: 738/10<sup>5</sup>

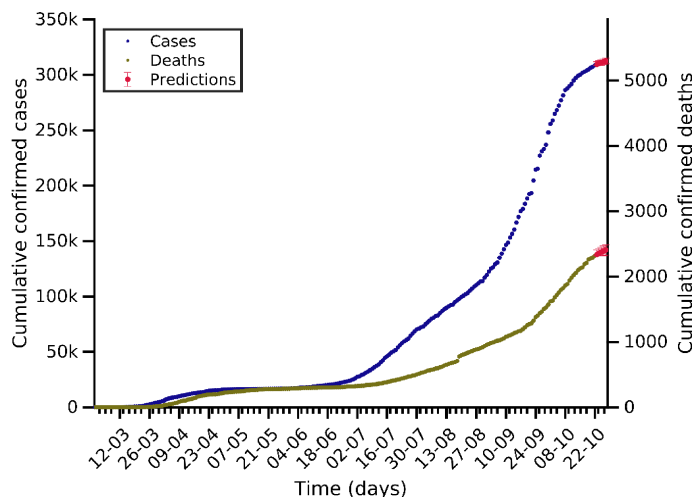


Predictions for next days		
Day	Number of cases	95% Confidence Interval
23-10-2020	327808 (+4929)	[ 322879 - 342313 ]
25-10-2020	339829 (+6037)	[ 324681 - 354976 ]
27-10-2020	352059 (+6141)	[ 335476 - 368642 ]

Current indicators		
A <sub>14</sub>	EPG	CFR
179	184	3.17 %



# Israel 22-10-2020. Pop: 8.7M. Cumulative incidence: 3565/10<sup>5</sup>

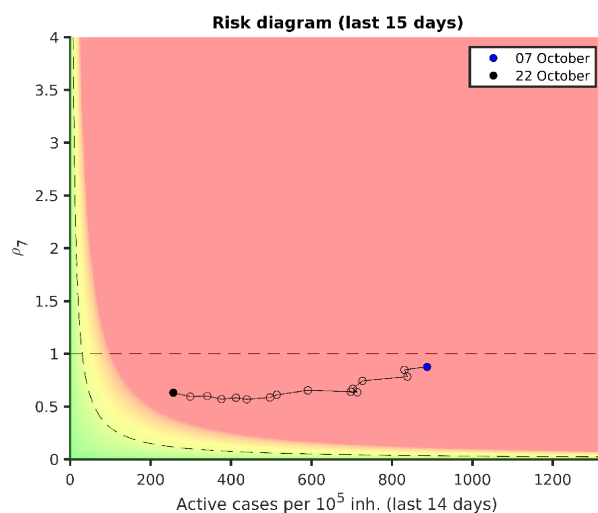
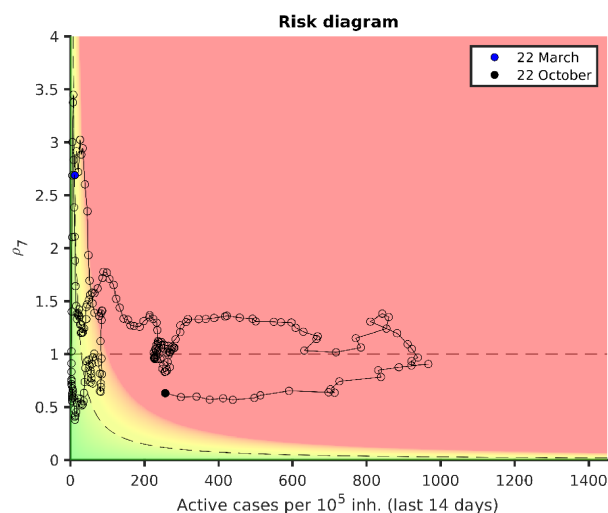
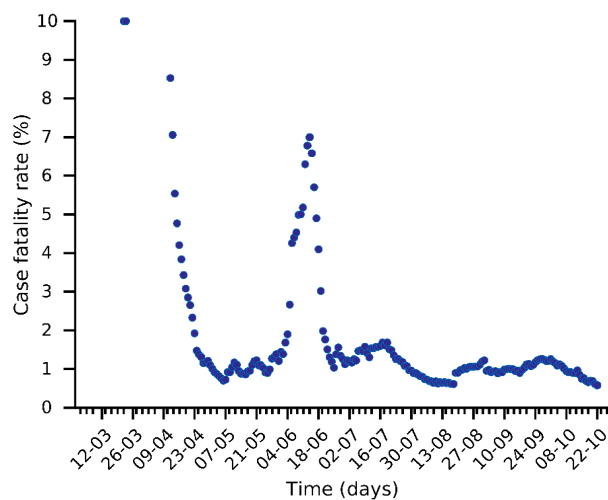
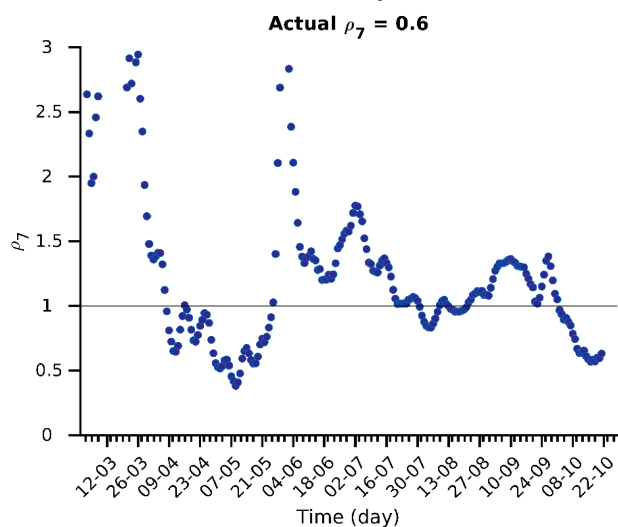
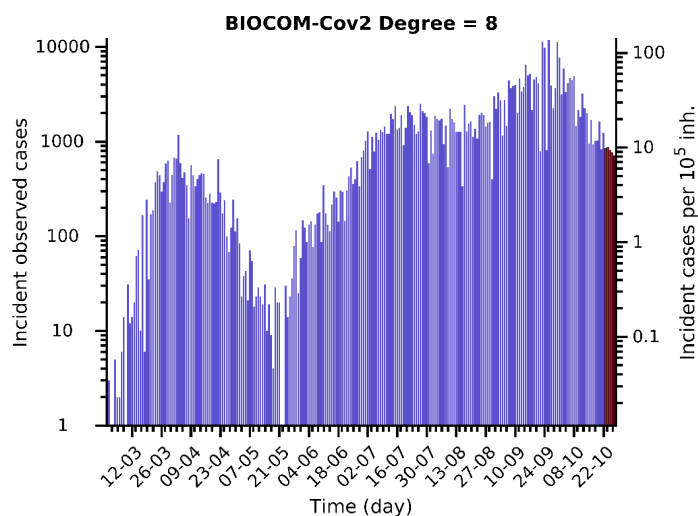
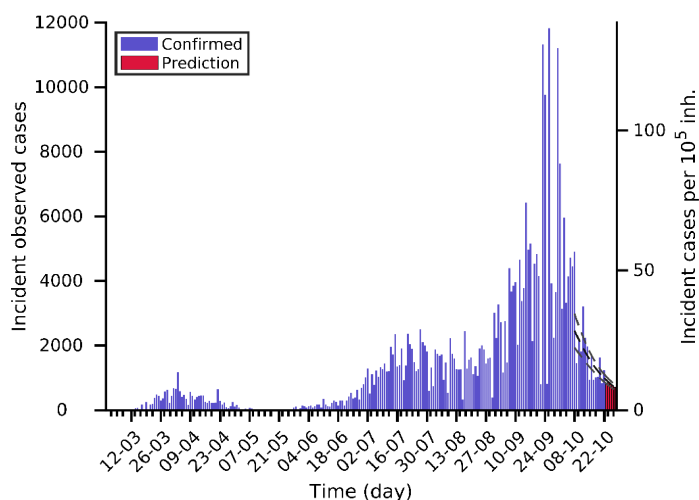


Predictions for next days

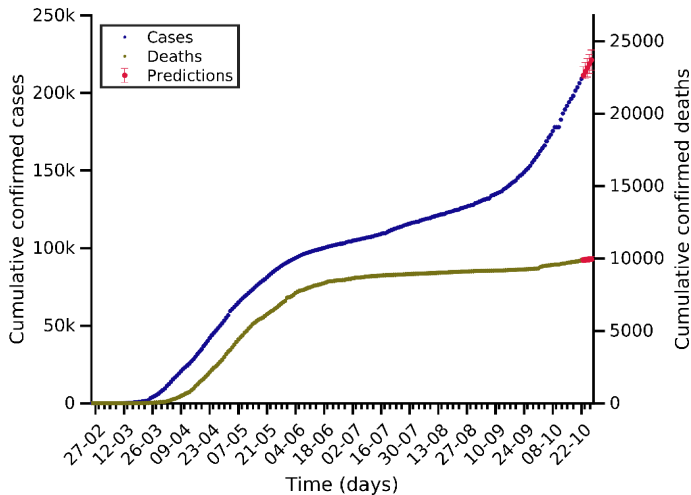
Day	Number of cases	95% Confidence Interval
23-10-2020	309417 (+845)	[ 308572 - 311848 ]
25-10-2020	311098 (+812)	[ 308612 - 313583 ]
27-10-2020	312565 (+709)	[ 309984 - 315146 ]

Current indicators

A <sub>14</sub>	EPG	CFR
256	162	0.58 %

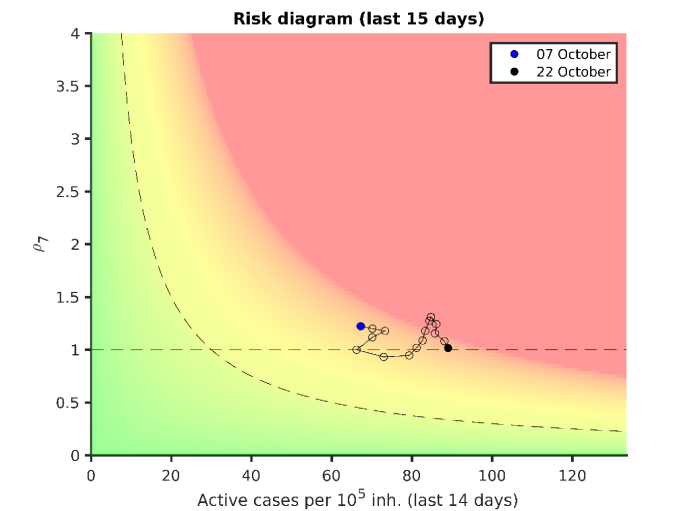
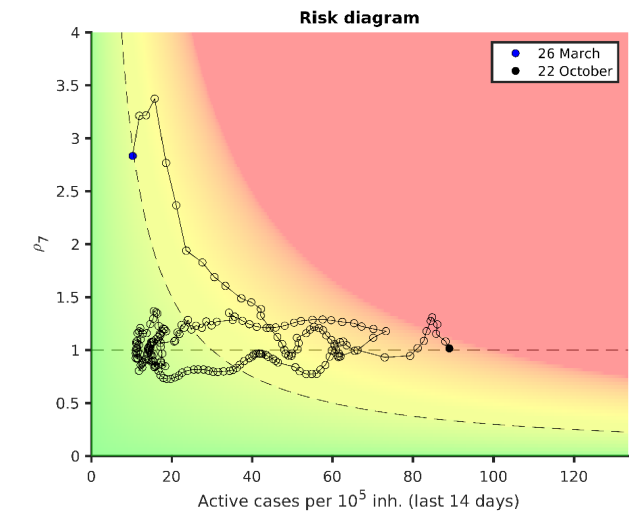
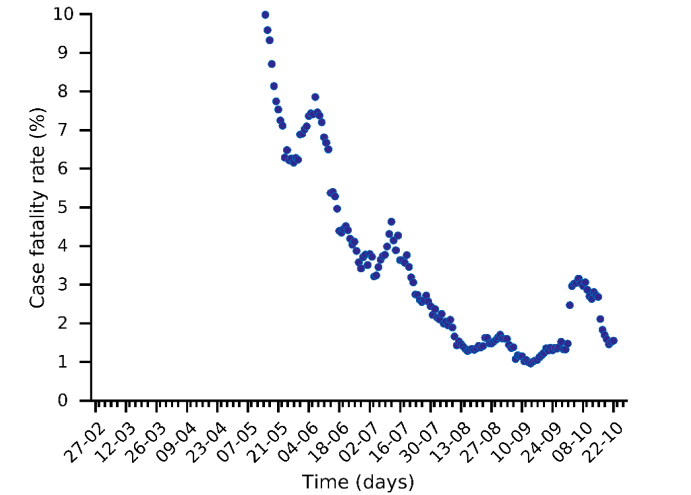
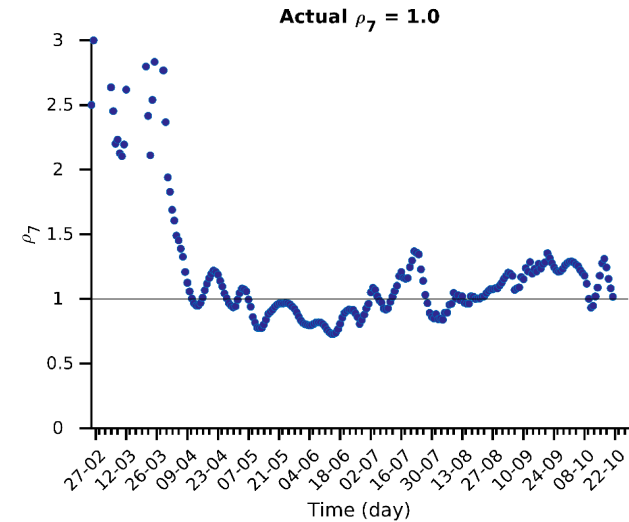
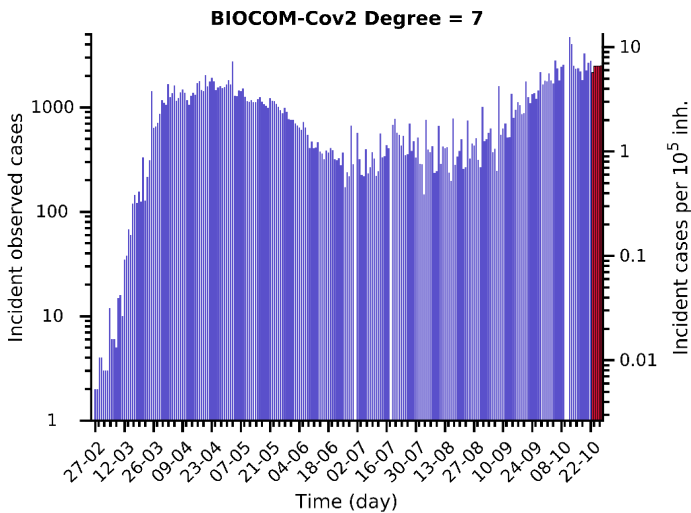
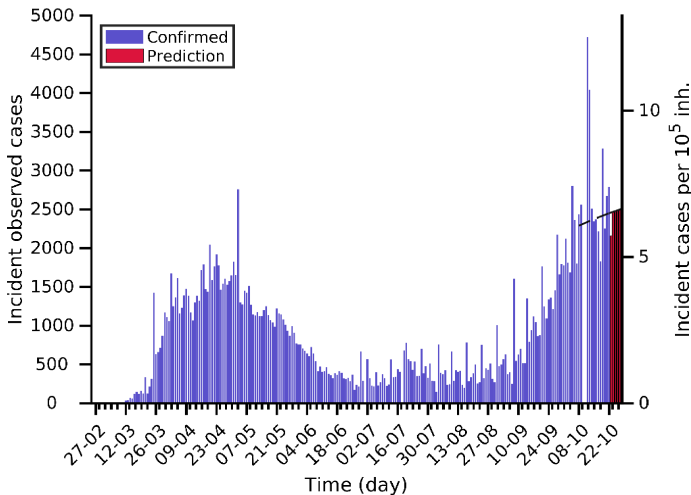


Canada 22-10-2020. Pop: 37.7M. Cumulative incidence: 554/10<sup>5</sup>

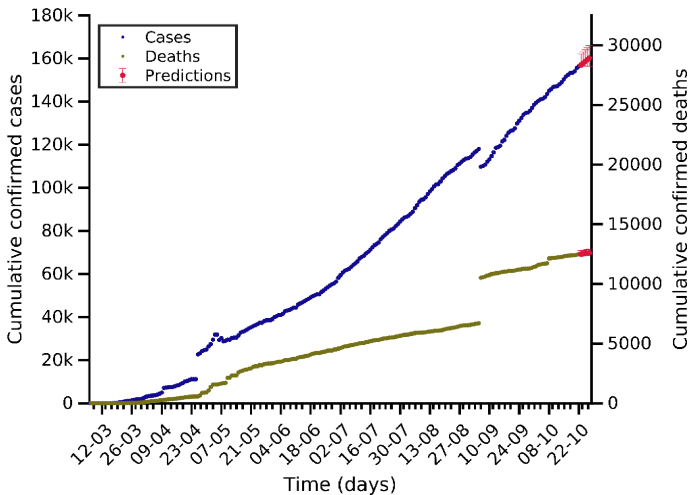


Predictions for next days		
Day	Number of cases	95% Confidence Interval
23-10-2020	211307 (+2159)	[ 209148 - 217000 ]
25-10-2020	216255 (+2479)	[ 210325 - 222186 ]
27-10-2020	221242 (+2498)	[ 214794 - 227690 ]

Current indicators		
A <sub>14</sub>	EPG	CFR
89	90	1.55 %

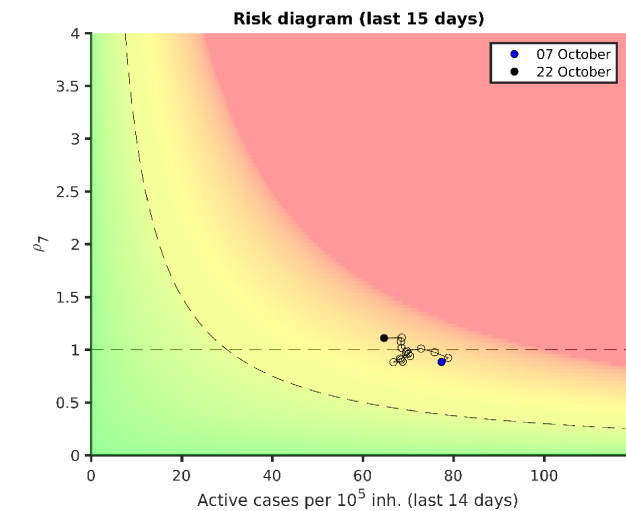
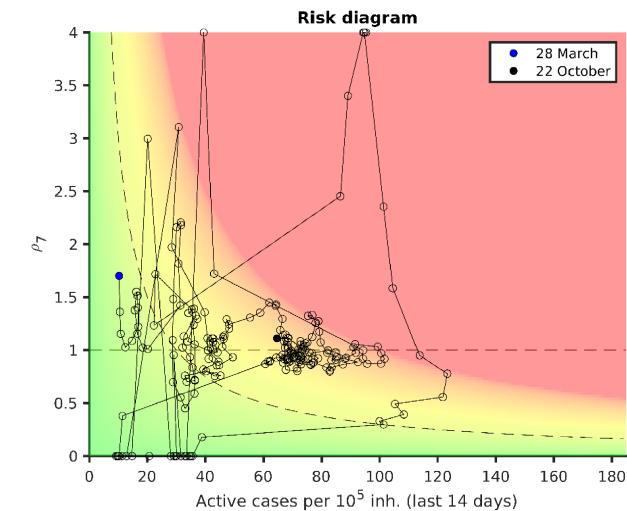
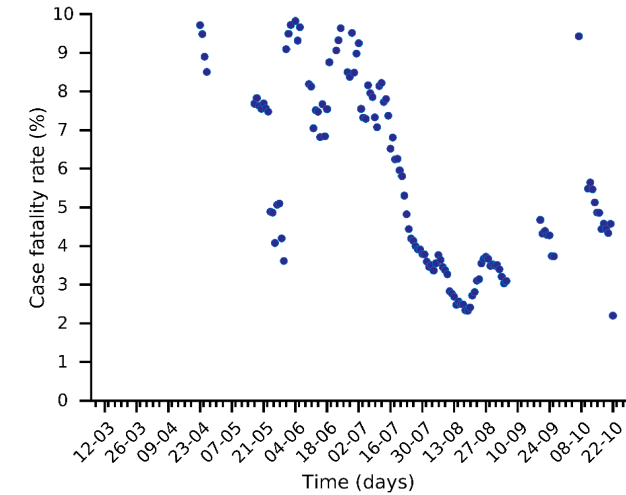
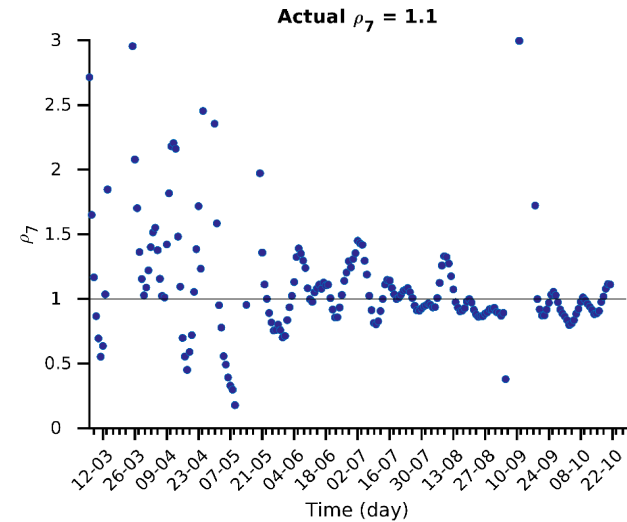
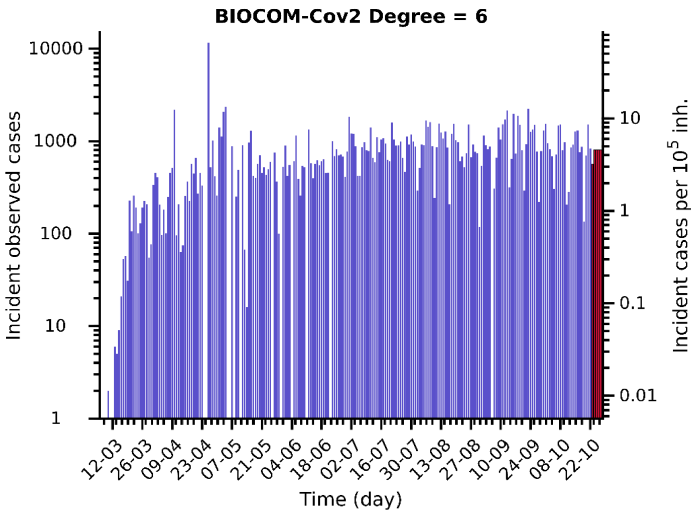
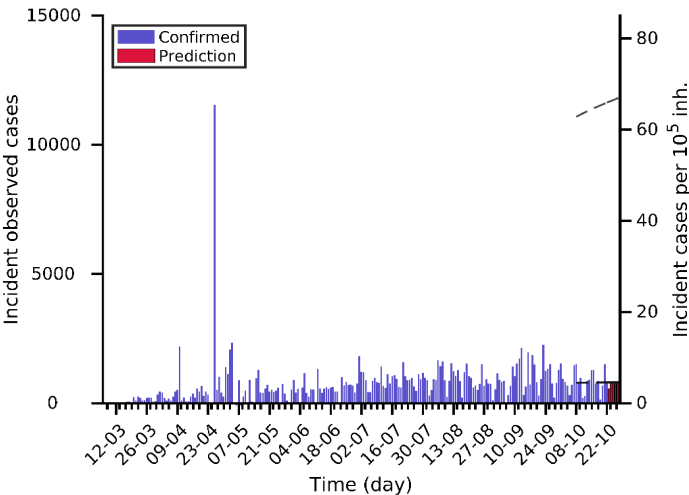


Ecuador 22-10-2020. Pop: 17.6M. Cumulative incidence: 887/10<sup>5</sup>

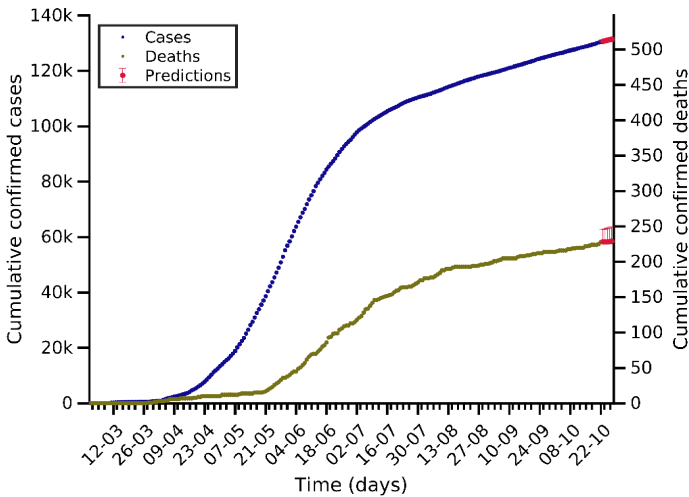


Predictions for next days		
Day	Number of cases	95% Confidence Interval
23-10-2020	157015 (+564)	[ 156451 - 162188 ]
25-10-2020	158620 (+803)	[ 156451 - 163997 ]
27-10-2020	160227 (+804)	[ 156451 - 166042 ]

Current indicators		
A <sub>14</sub>	EPG	CFR
65	72	2.20 %

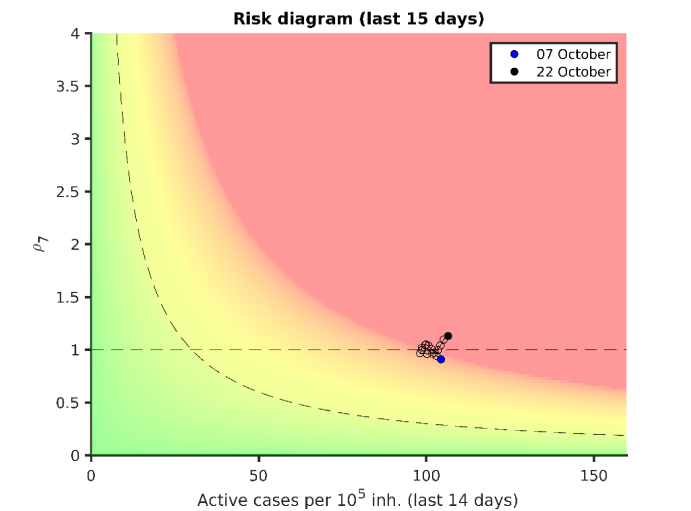
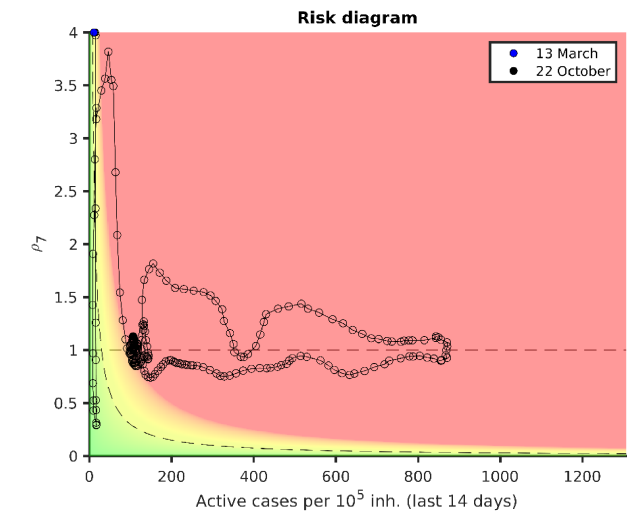
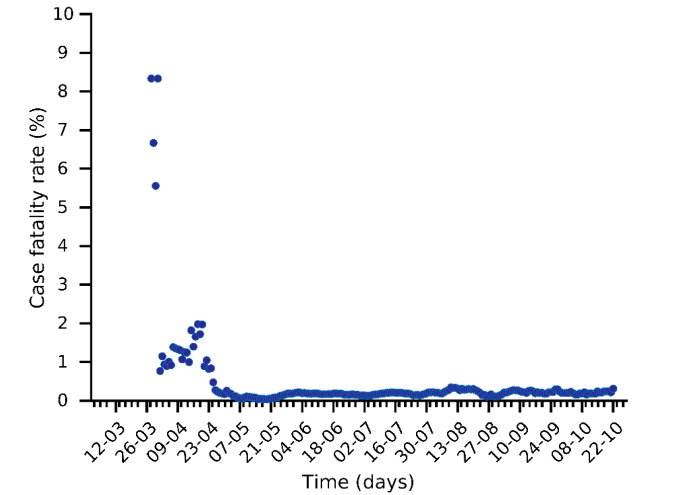
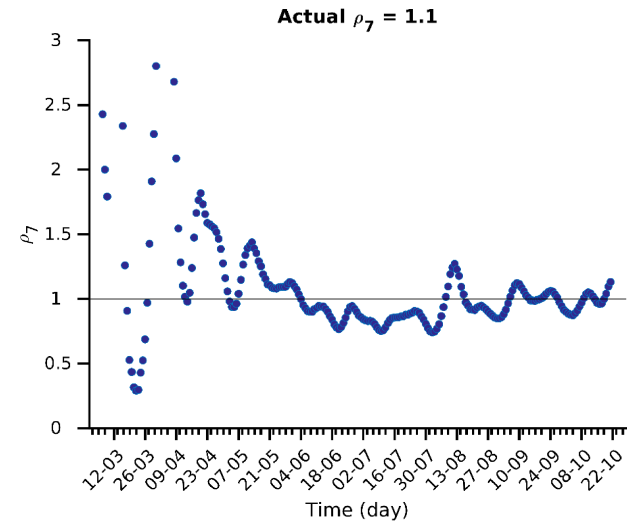
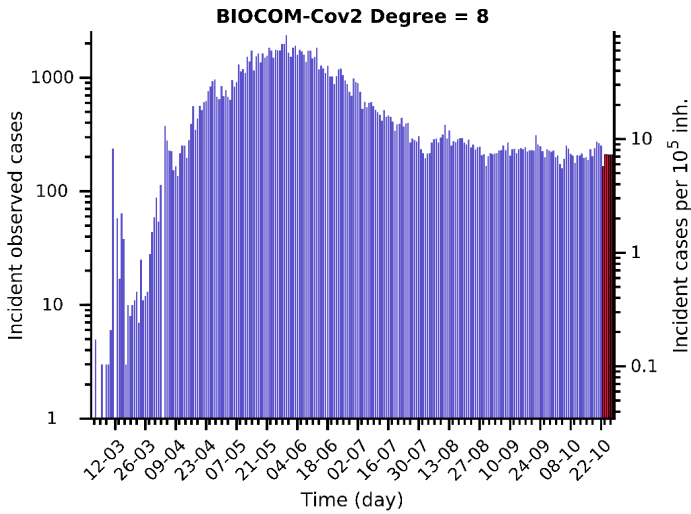
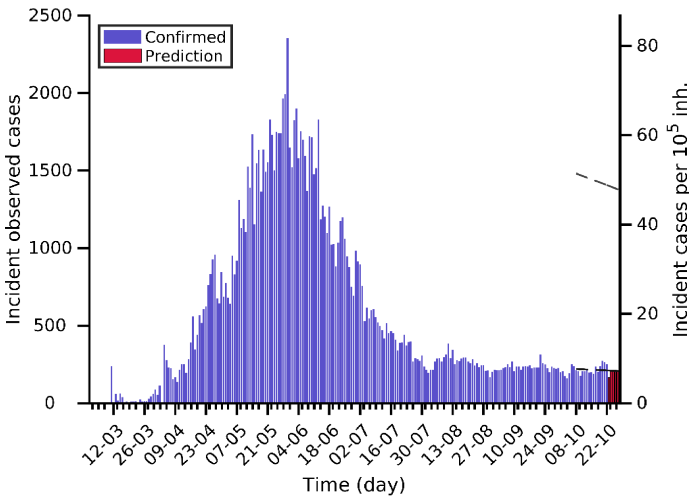


Qatar 22-10-2020. Pop: 2.9M. Cumulative incidence: 4528/10<sup>5</sup>

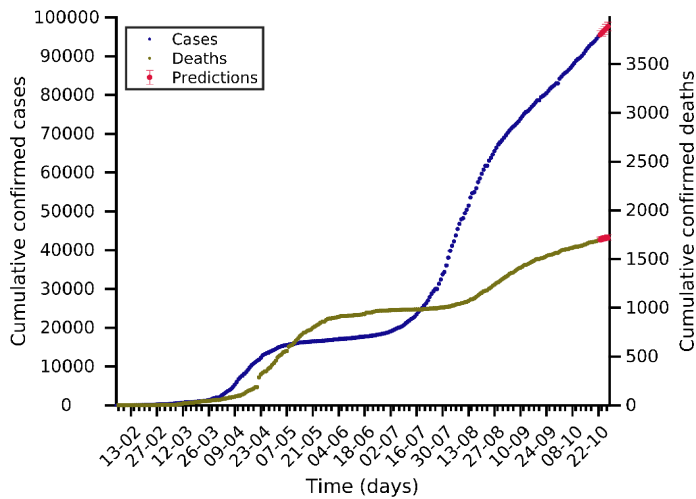


Predictions for next days		
Day	Number of cases	95% Confidence Interval
23-10-2020	130627 (+165)	[ 130462 - 131259 ]
25-10-2020	131047 (+210)	[ 130462 - 131703 ]
27-10-2020	131464 (+208)	[ 130758 - 132170 ]

Current indicators		
A <sub>14</sub>	EPG	CFR
106	120	0.31 %



# Japan 22-10-2020. Pop: 126.5M. Cumulative incidence: 75/10<sup>5</sup>

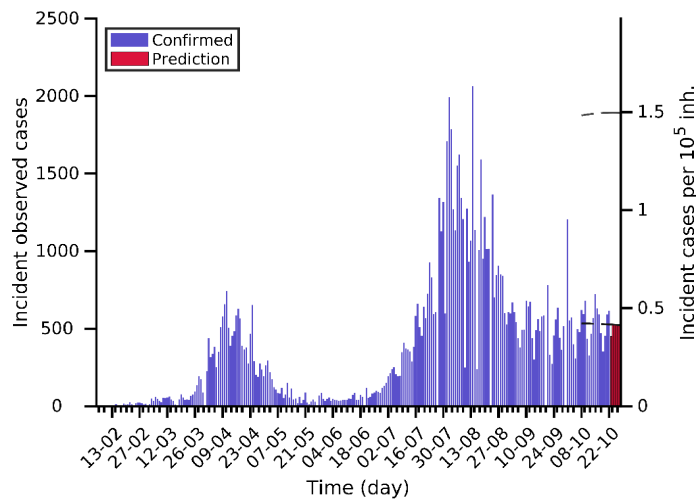


Predictions for next days

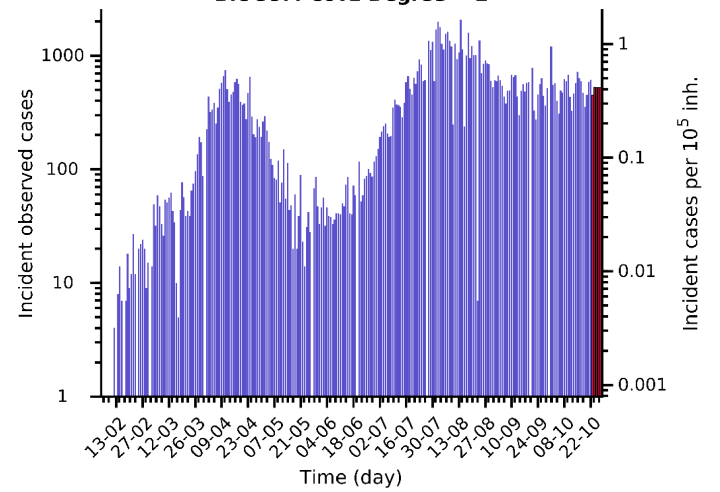
Day	Number of cases	95% Confidence Interval
23-10-2020	95589 (+451)	[ 95138 - 96582 ]
25-10-2020	96639 (+525)	[ 95607 - 97670 ]
27-10-2020	97686 (+523)	[ 96572 - 98800 ]

Current indicators

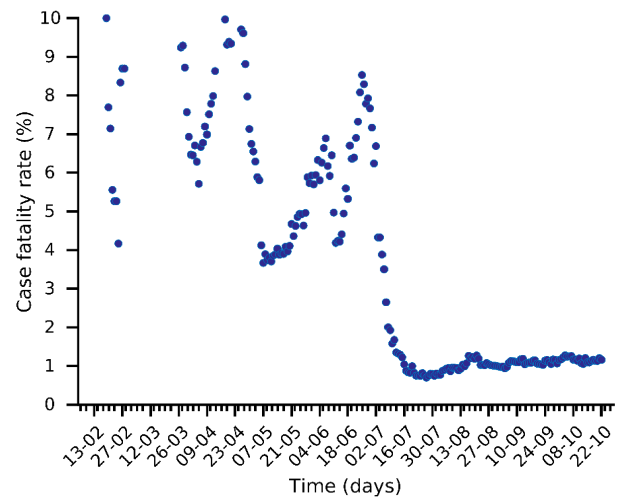
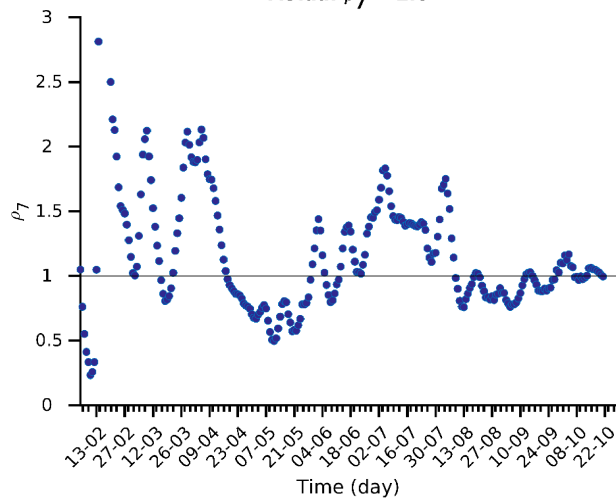
A <sub>14</sub>	EPG	CFR
6	6	1.16 %



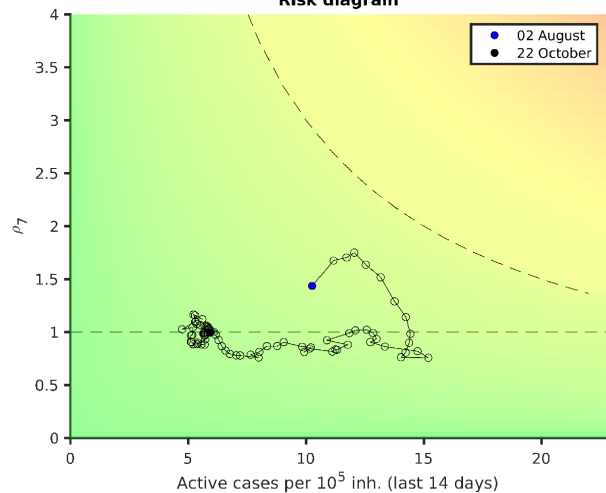
BIOCOM-Cov2 Degree = 2



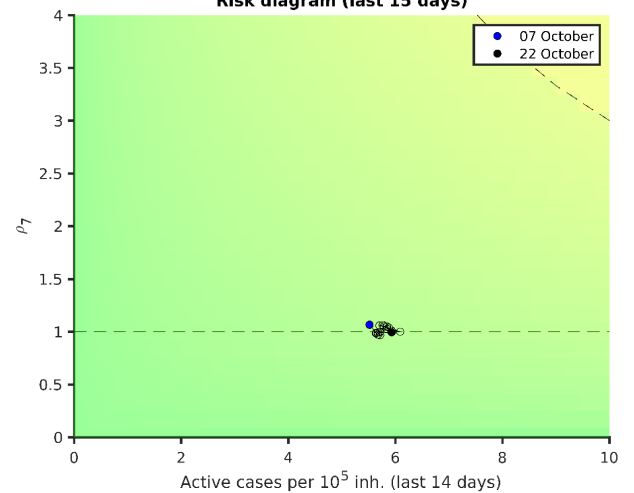
Actual  $\rho_7 = 1.0$



Risk diagram

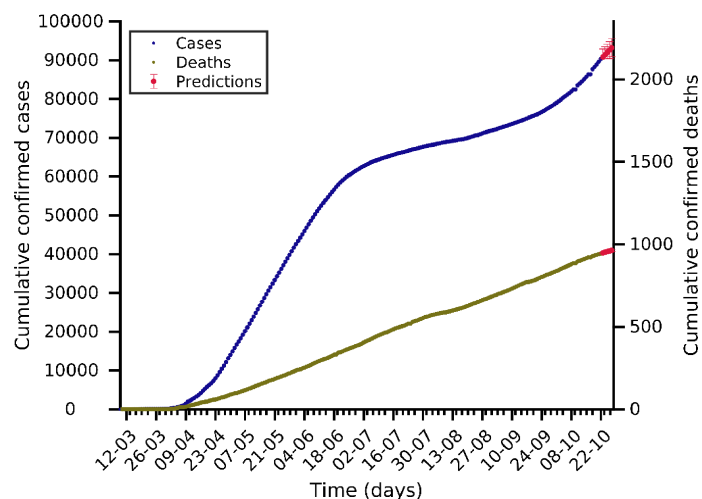


Risk diagram (last 15 days)





# Belarus 22-10-2020. Pop: 9.4M. Cumulative incidence: 956/10<sup>5</sup>

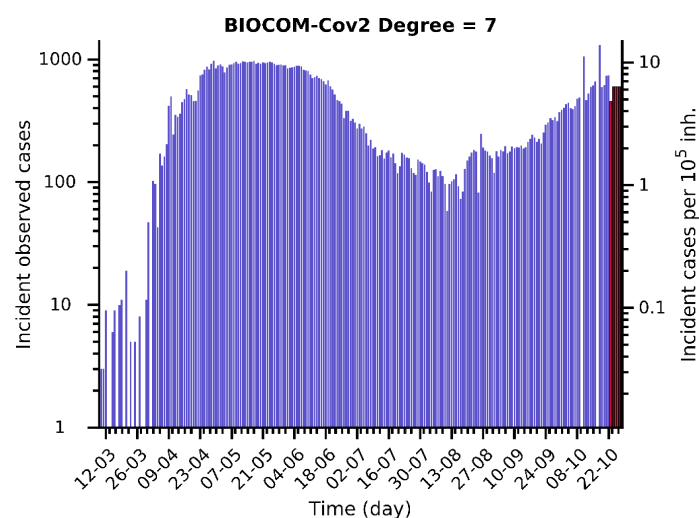
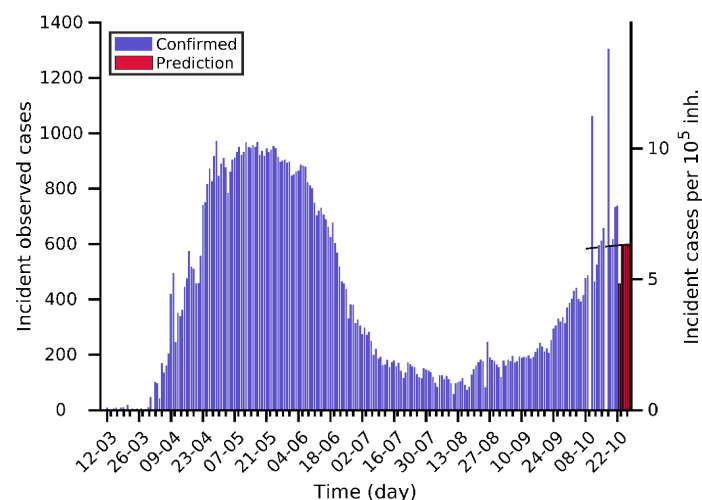


Predictions for next days

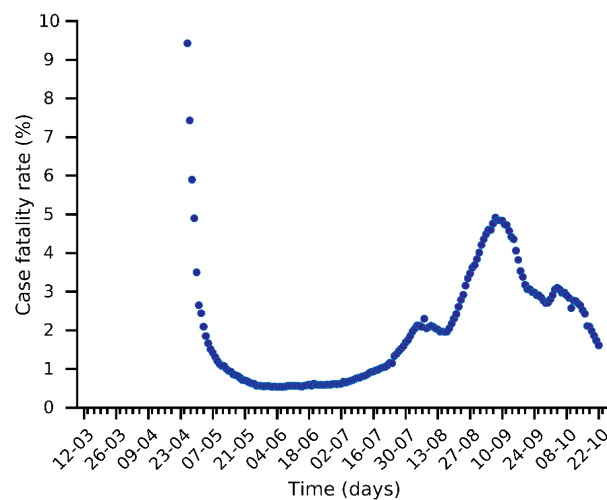
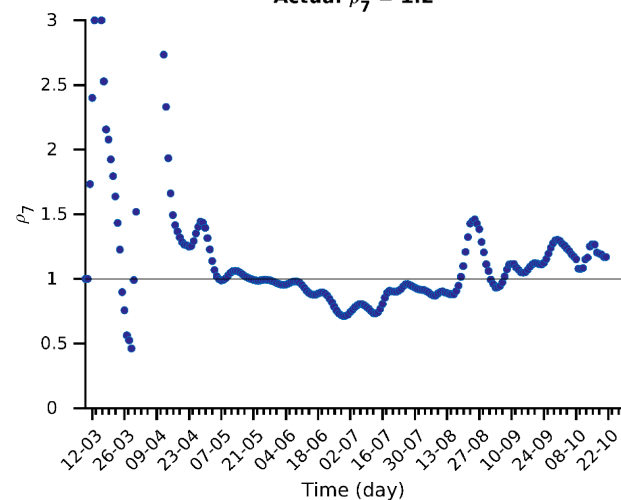
Day	Number of cases	95% Confidence Interval
23-10-2020	90836 (+456)	[ 90380 - 92889 ]
25-10-2020	92030 (+597)	[ 90380 - 94165 ]
27-10-2020	93227 (+599)	[ 90915 - 95538 ]

Current indicators

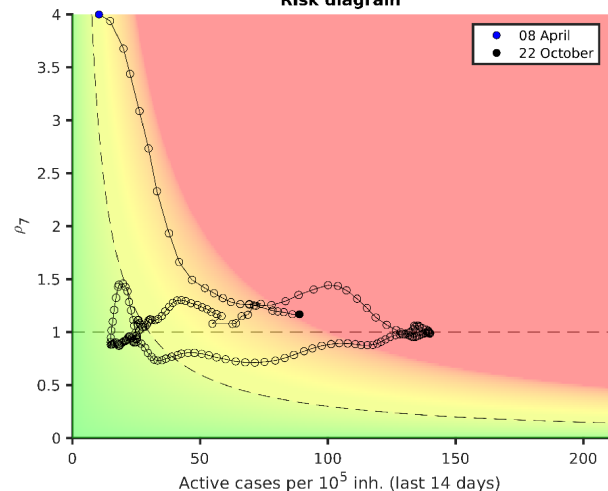
A <sub>14</sub>	EPG	CFR
89	104	1.61 %



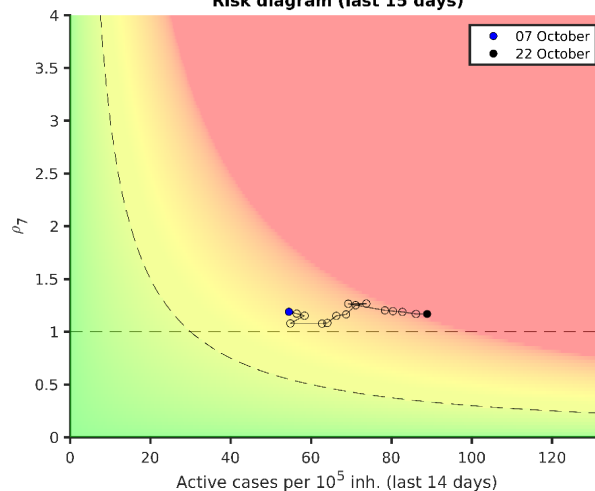
Actual  $\rho_7 = 1.2$



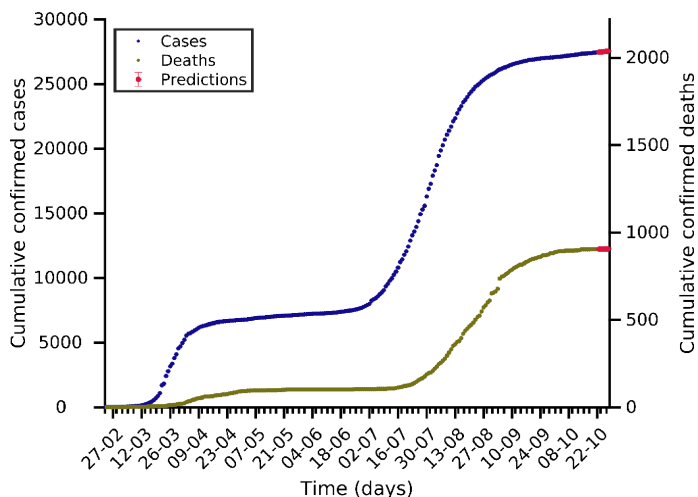
Risk diagram



Risk diagram (last 15 days)



# Australia 22-10-2020. Pop: 25.5M. Cumulative incidence: 108/10<sup>5</sup>

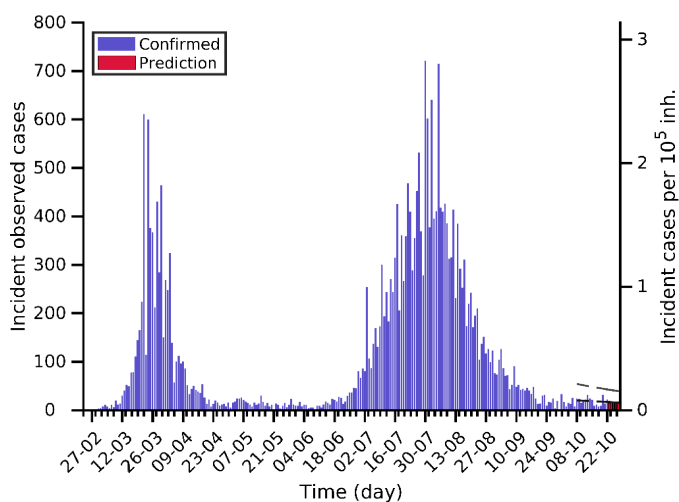


Predictions for next days

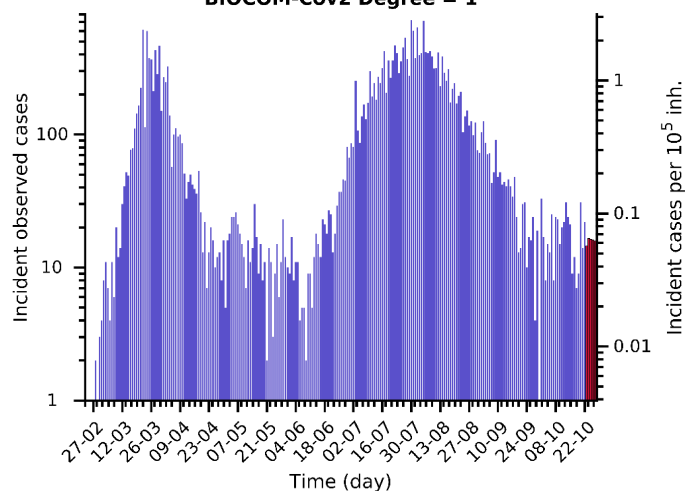
Day	Number of cases	95% Confidence Interval
23-10-2020	27481 (+15)	[ 27466 - 27525 ]
25-10-2020	27513 (+16)	[ 27468 - 27559 ]
27-10-2020	27545 (+16)	[ 27497 - 27594 ]

Current indicators

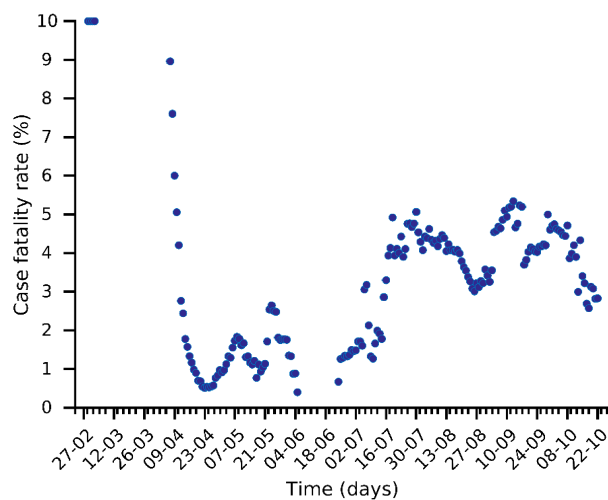
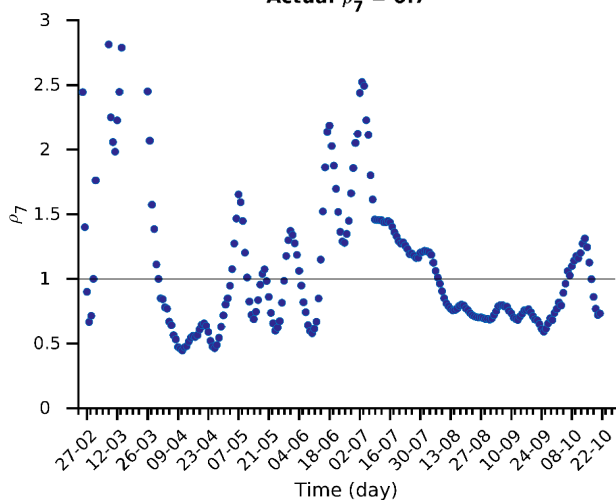
A <sub>14</sub>	EPG	CFR
1	1	2.83 %



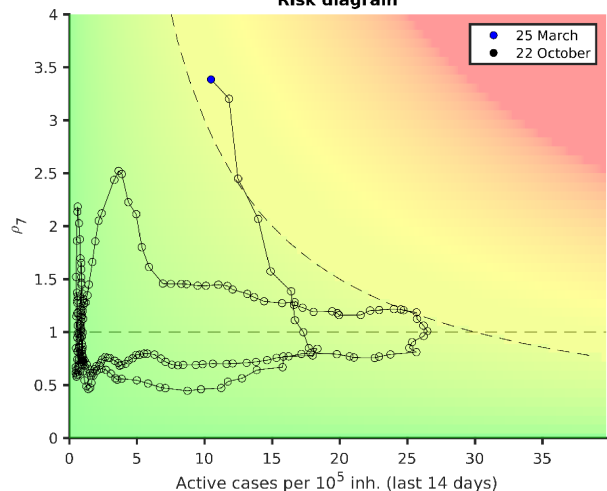
BIOCOM-Cov2 Degree = 1



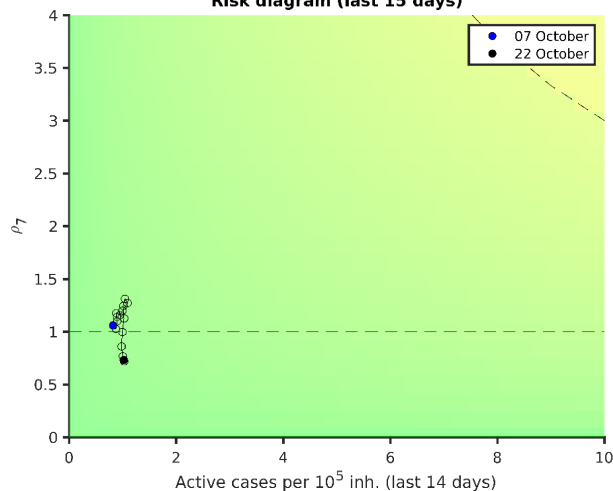
Actual  $\rho_7 = 0.7$



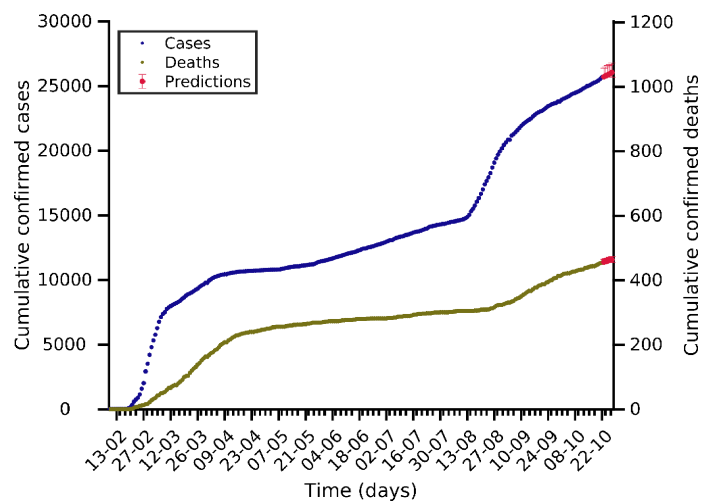
Risk diagram



Risk diagram (last 15 days)



# South Korea 22-10-2020. Pop: 51.3M. Cumulative incidence: 50/10<sup>5</sup>

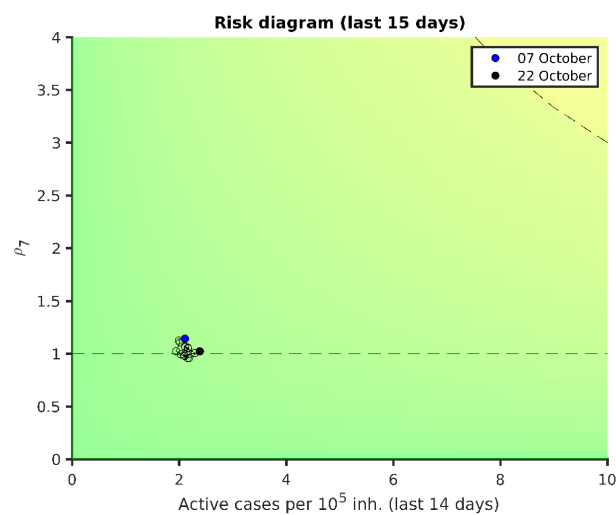
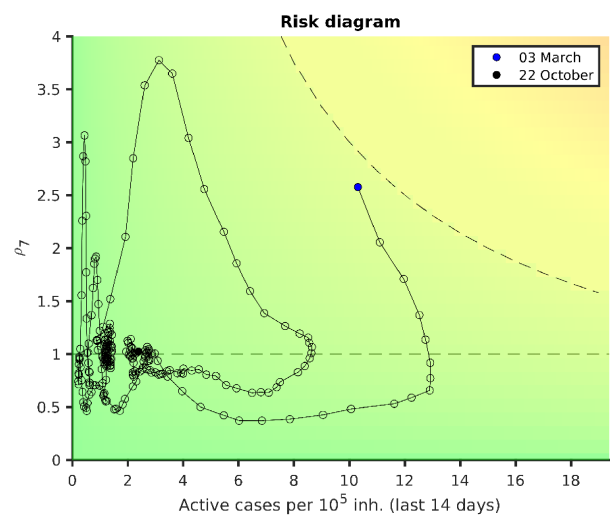
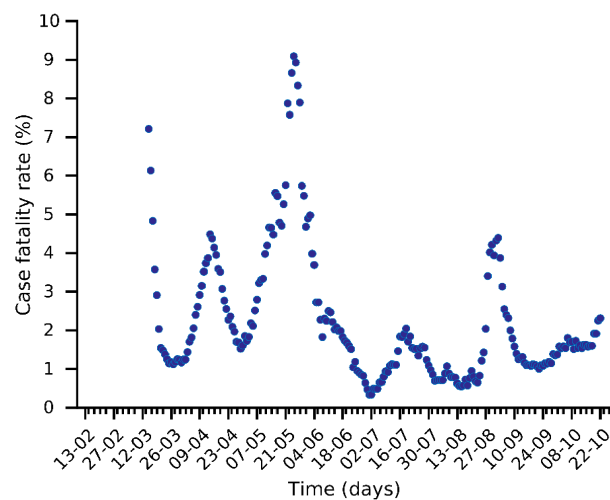
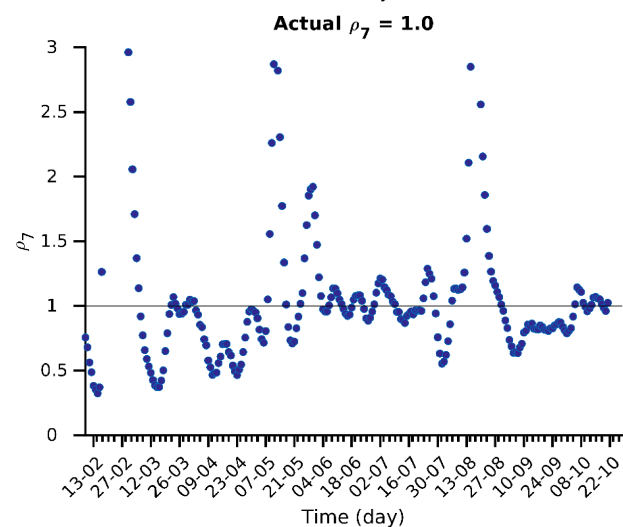
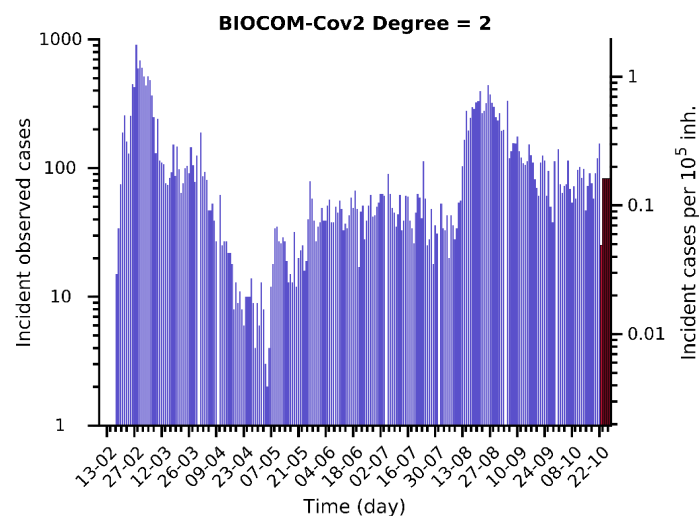
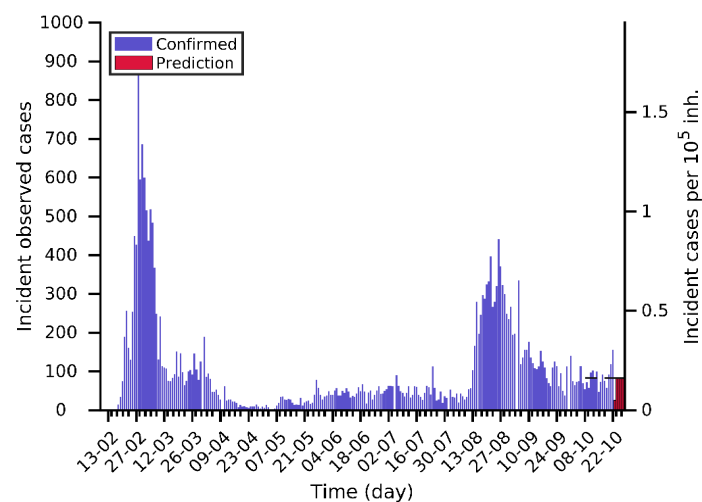


Predictions for next days

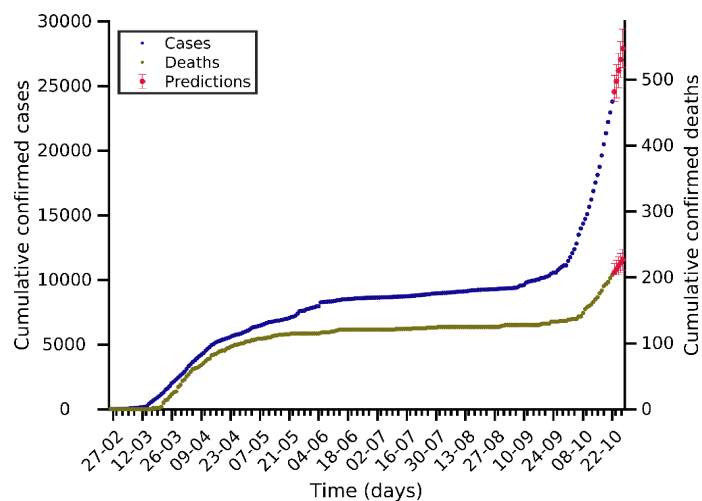
Day	Number of cases	95% Confidence Interval
23-10-2020	25723 (+25)	[ 25698 - 26386 ]
25-10-2020	25889 (+83)	[ 25698 - 26578 ]
27-10-2020	26055 (+83)	[ 25698 - 26798 ]

Current indicators

A <sub>14</sub>	EPG	CFR
2	2	2.31 %



# Malaysia 22-10-2020. Pop: 32.4M. Cumulative incidence: 74/10<sup>5</sup>

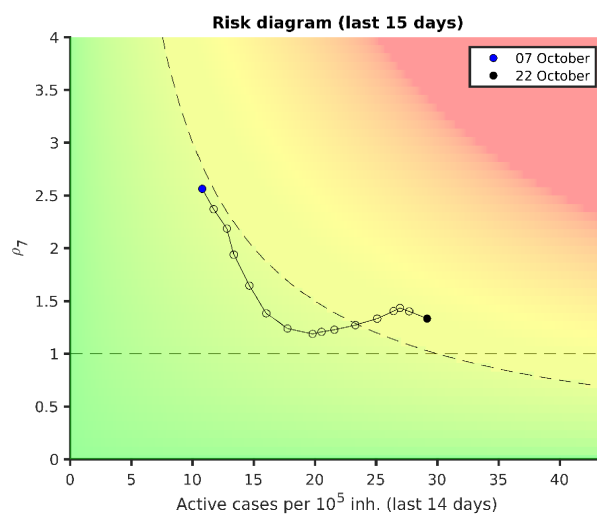
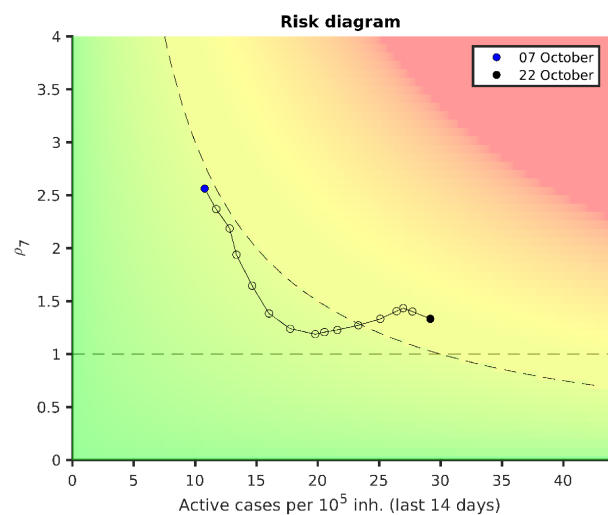
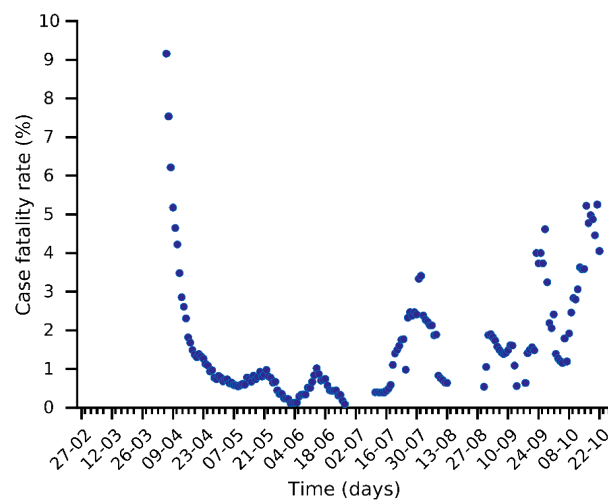
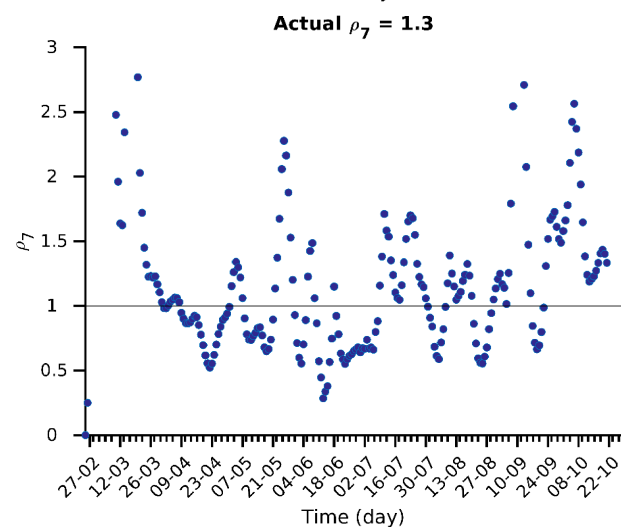
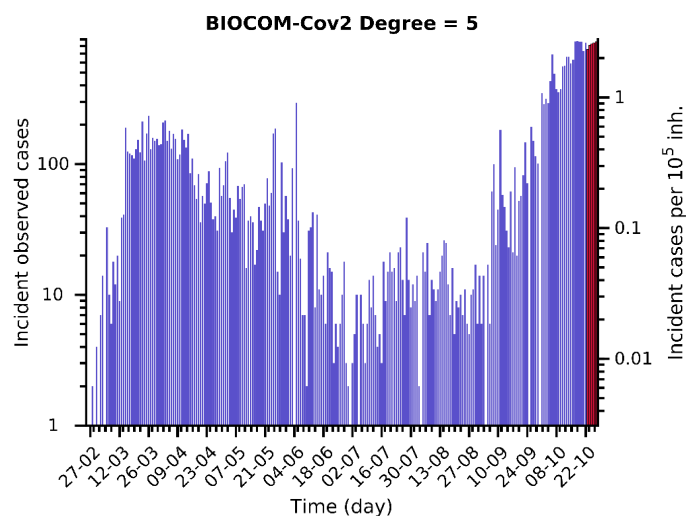
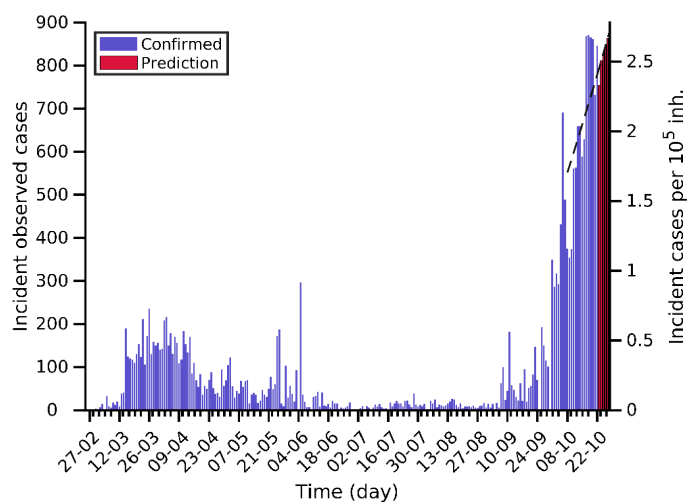


Predictions for next days

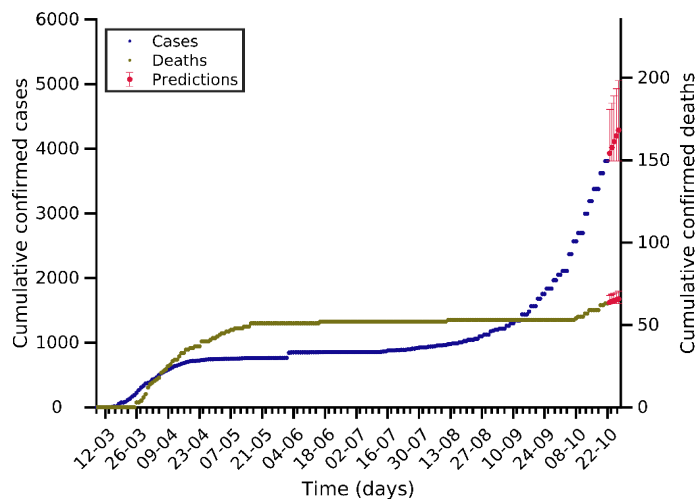
Day	Number of cases	95% Confidence Interval
23-10-2020	24558 (+754)	[ 23804 - 25831 ]
25-10-2020	26200 (+829)	[ 24862 - 27538 ]
27-10-2020	27910 (+864)	[ 26419 - 29401 ]

Current indicators

A <sub>14</sub>	EPG	CFR
29	39	4.05 %



# Andorra 22-10-2020. Pop: 0.1M. Cumulative incidence: 4932/10<sup>5</sup>

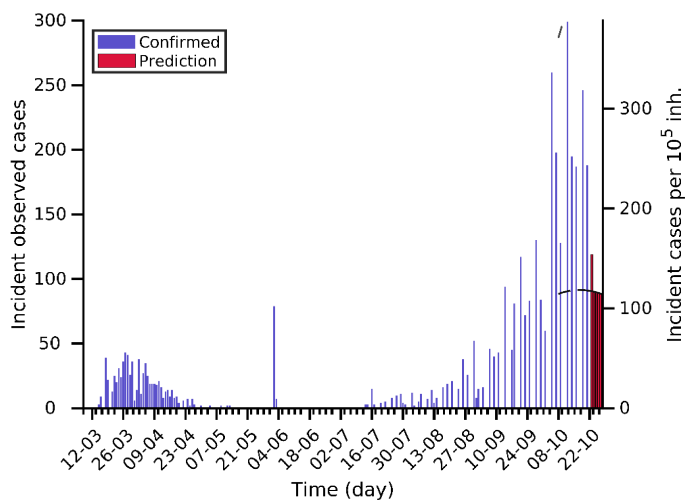


Predictions for next days

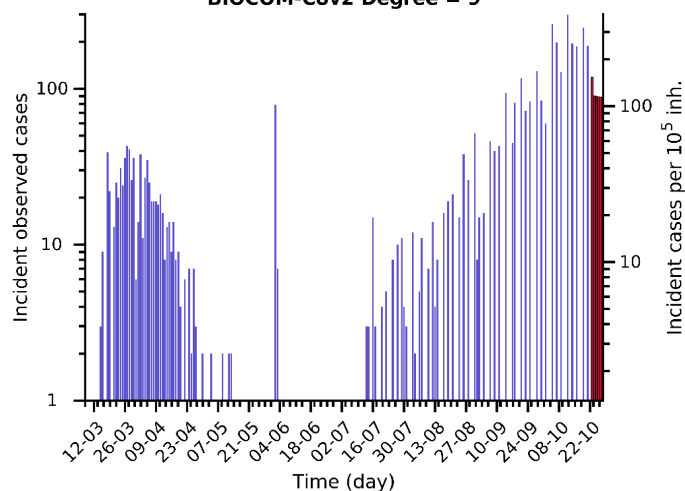
Day	Number of cases	95% Confidence Interval
23-10-2020	3930 (+119)	[ 3811 - 4609 ]
25-10-2020	4110 (+90)	[ 3811 - 4817 ]
27-10-2020	4288 (+89)	[ 3811 - 5055 ]

Current indicators

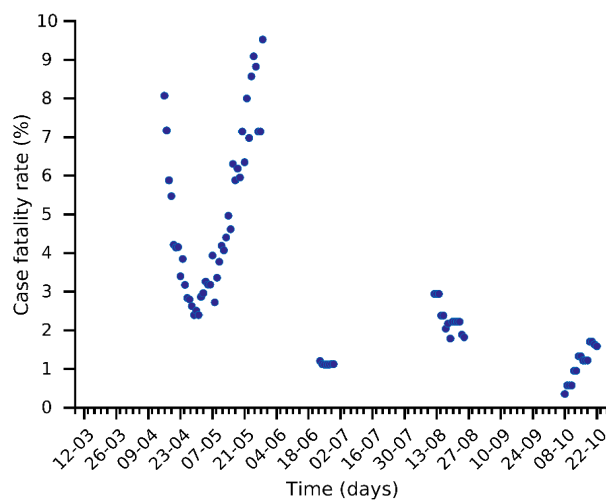
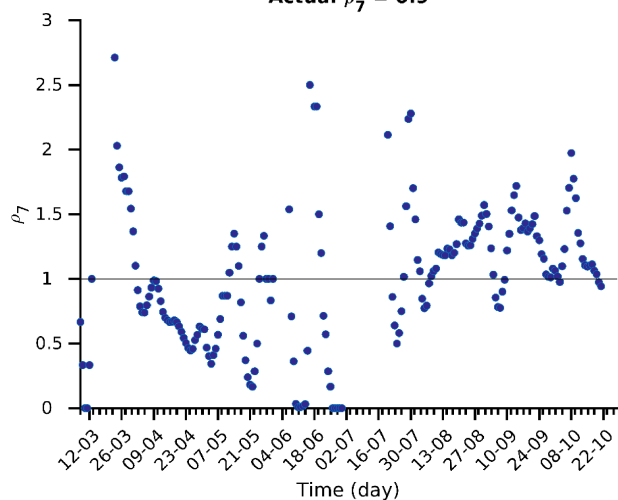
A <sub>14</sub>	EPG	CFR
1609	1516	1.59 %



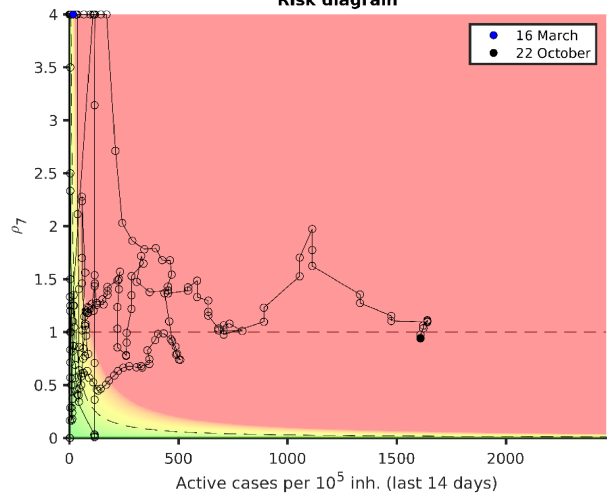
BIOCOM-Cov2 Degree = 9



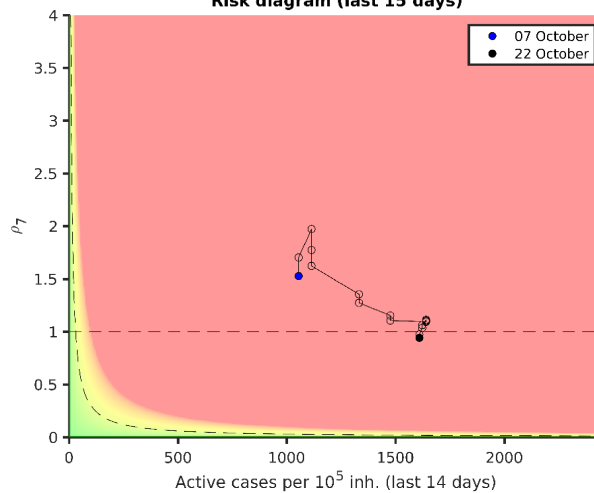
Actual  $\rho_7 = 0.9$



Risk diagram

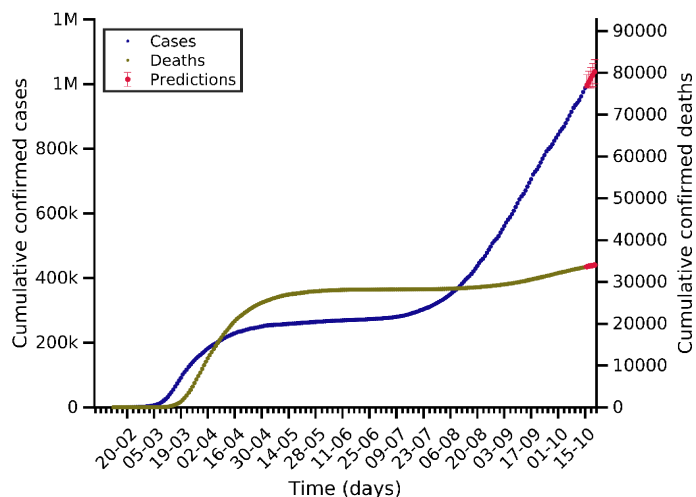


Risk diagram (last 15 days)



### **(3) Analysis and prediction of COVID-19 for Spain and its regions**

# Spain 15-10-2020. Pop: 47.0M. Cumulative incidence: 2101/10<sup>5</sup>

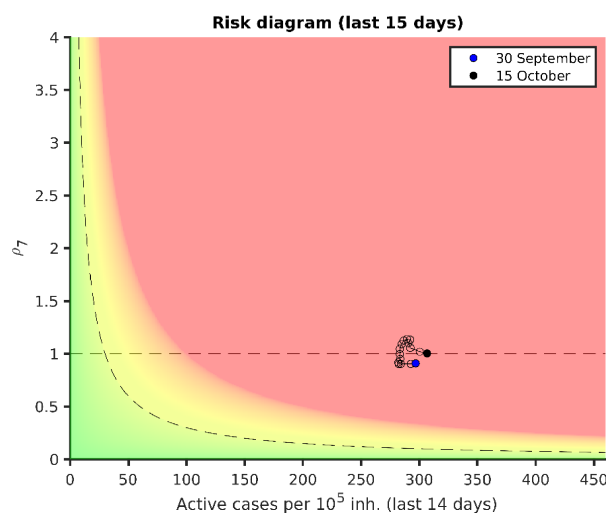
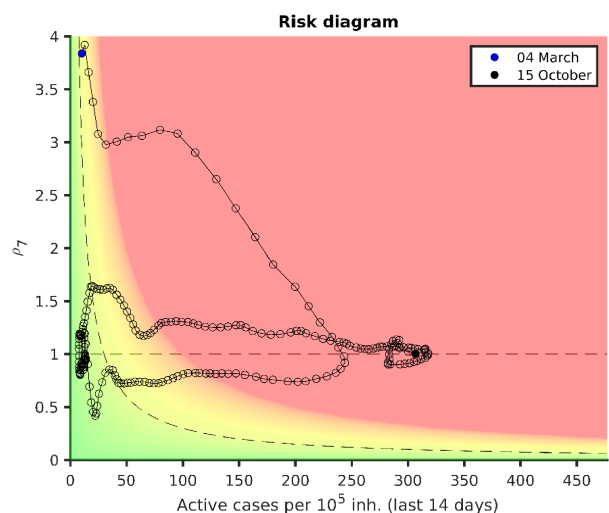
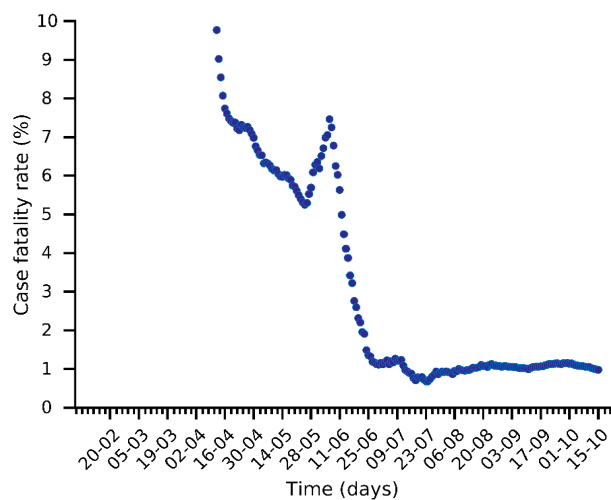
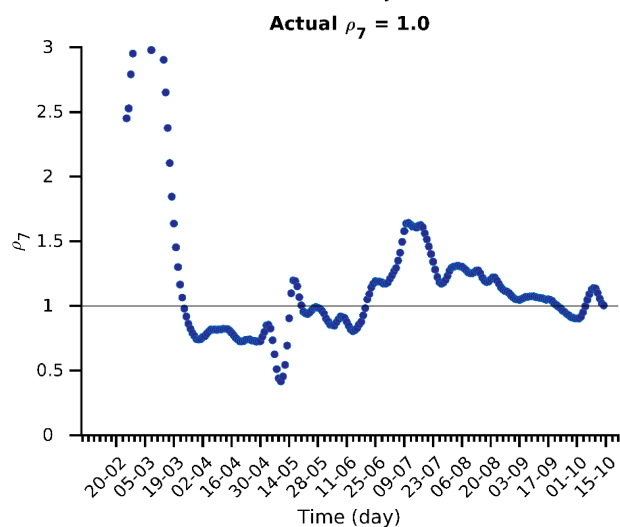
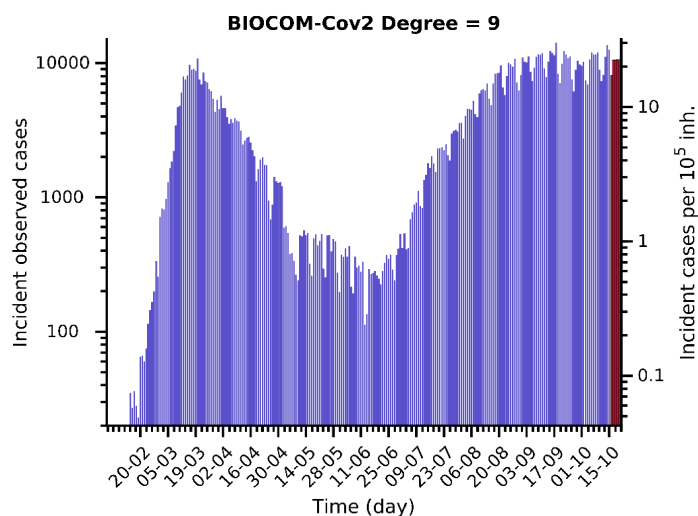
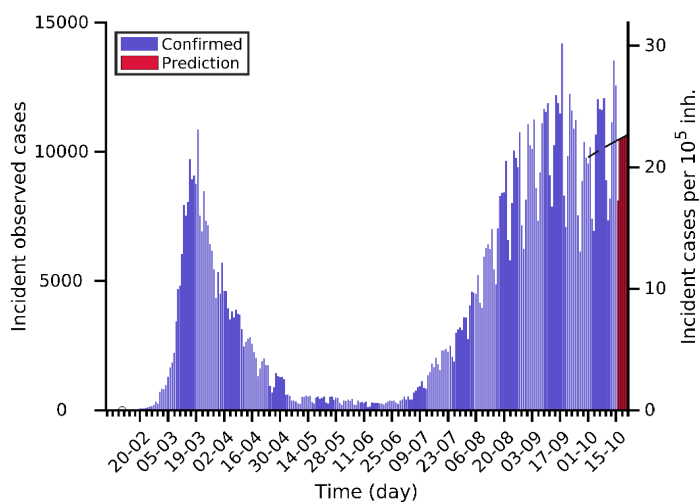


Predictions for next days

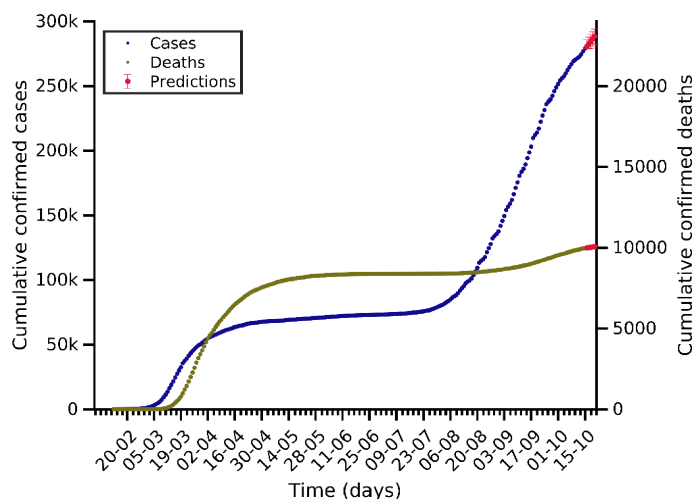
Day	Number of cases	95% Confidence Interval
16-10-2020	996147 (+8097)	[ 988050 - 1029016 ]
18-10-2020	1017189 (+10541)	[ 988050 - 1051417 ]
20-10-2020	1038388 (+10619)	[ 1001195 - 1075580 ]

Current indicators

A <sub>14</sub>	EPG	CFR
307	308	0.98 %



# Madrid 15-10-2020. Pop: 6.7M. Cumulative incidence: 4188/10<sup>5</sup>

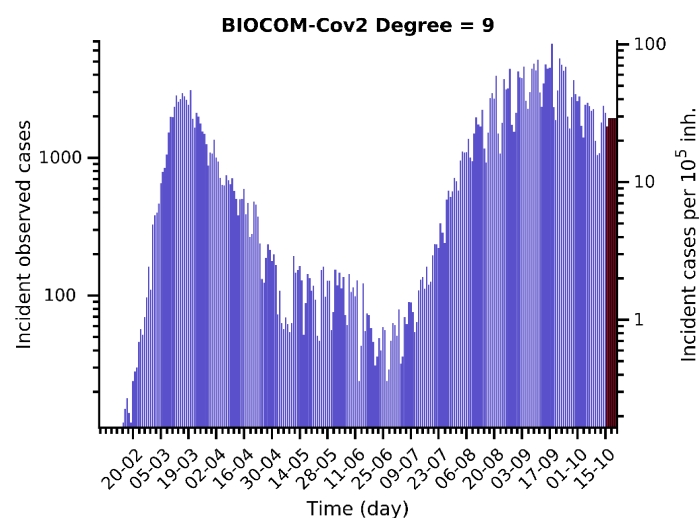
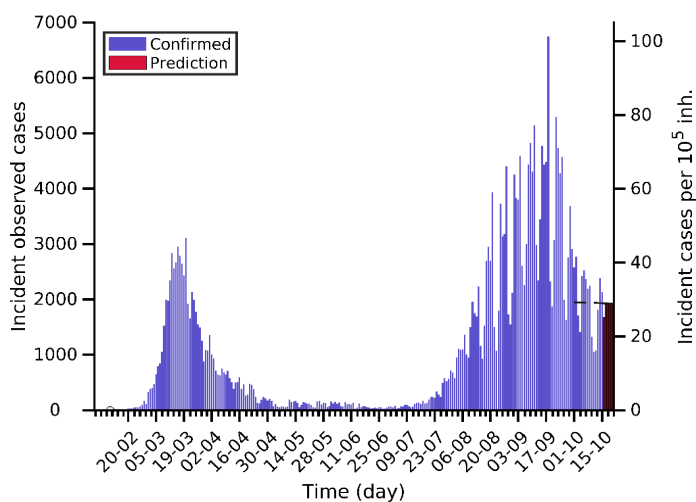


Predictions for next days

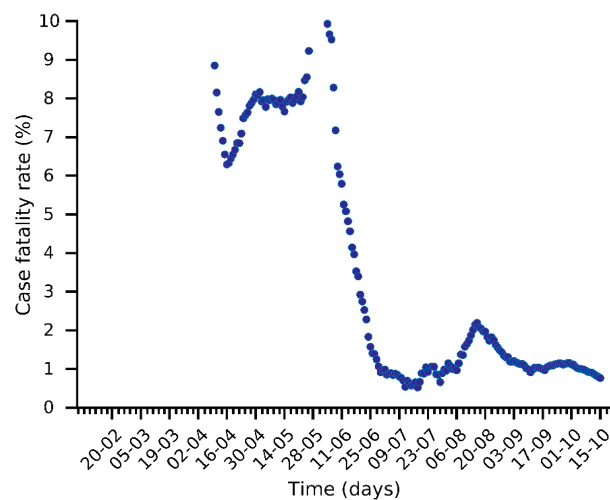
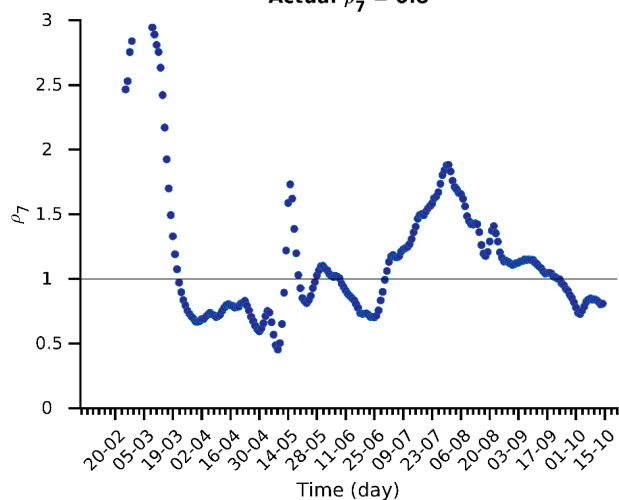
Day	Number of cases	95% Confidence Interval
16-10-2020	280727 (+1680)	[ 279047 - 285894 ]
18-10-2020	284585 (+1928)	[ 279215 - 289955 ]
20-10-2020	288435 (+1924)	[ 282631 - 294239 ]

Current indicators

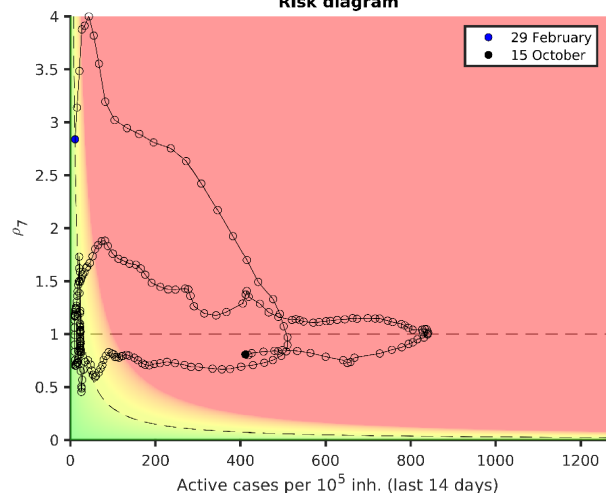
A <sub>14</sub>	EPG	CFR
412	333	0.76 %



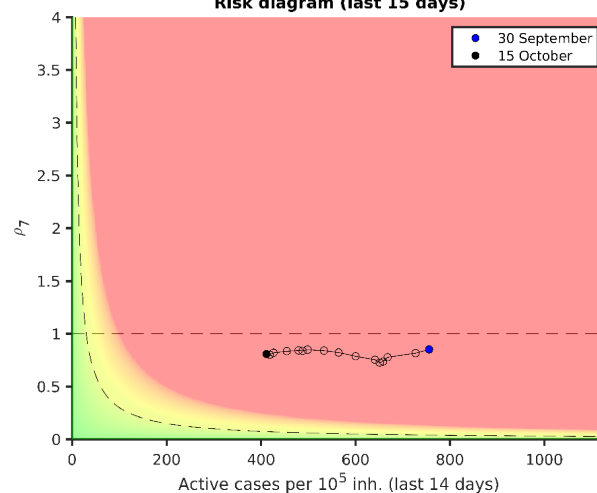
Actual  $\rho_7 = 0.8$



Risk diagram

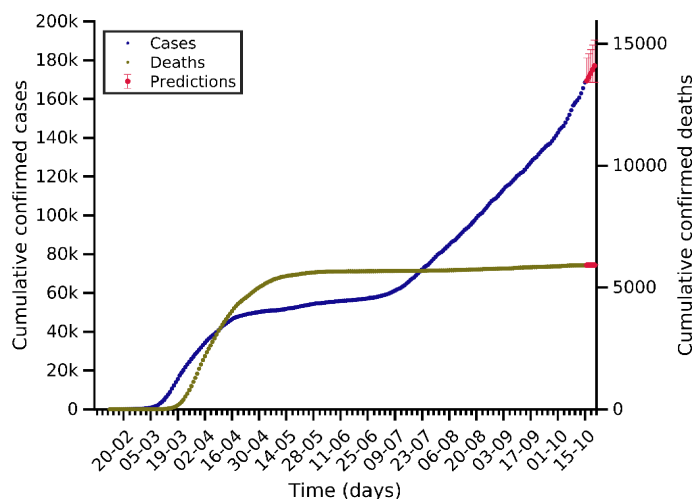


Risk diagram (last 15 days)





# Catalunya 15-10-2020. Pop: 7.7M. Cumulative incidence: 2196/10<sup>5</sup>

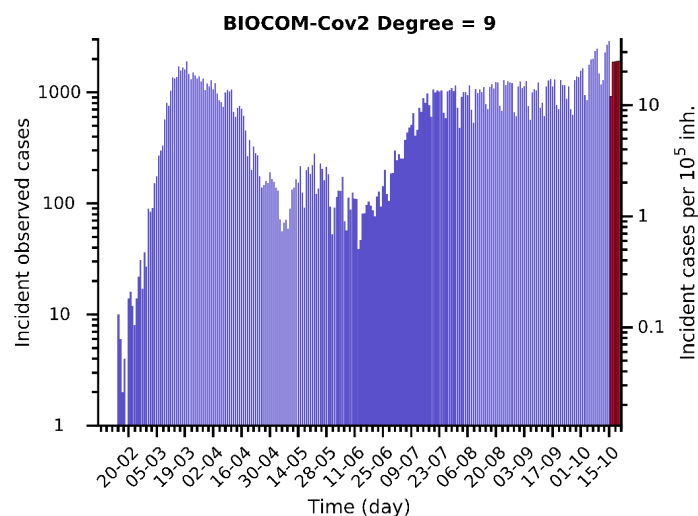
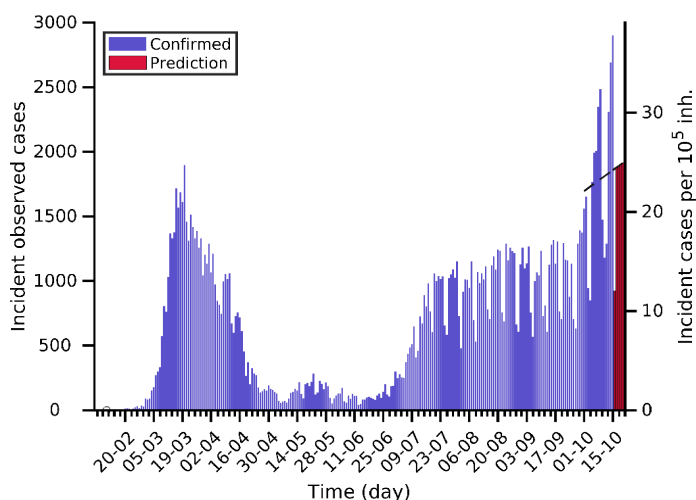


Predictions for next days

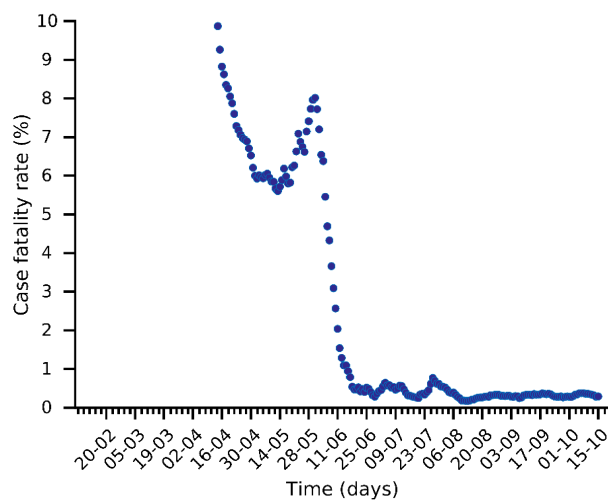
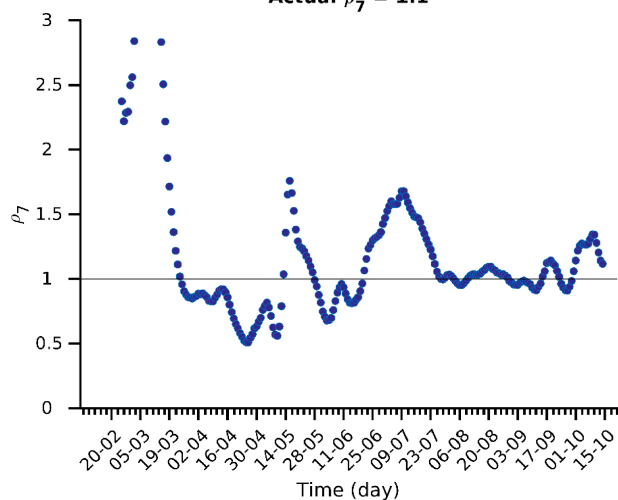
Day	Number of cases	95% Confidence Interval
16-10-2020	169488 (+923)	[ 168565 - 181215 ]
18-10-2020	173259 (+1891)	[ 168565 - 185481 ]
20-10-2020	177076 (+1914)	[ 168565 - 190382 ]

Current indicators

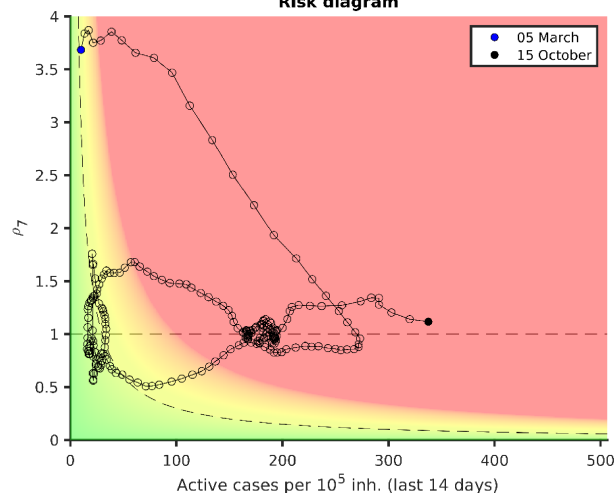
A <sub>14</sub>	EPG	CFR
337	377	0.29 %



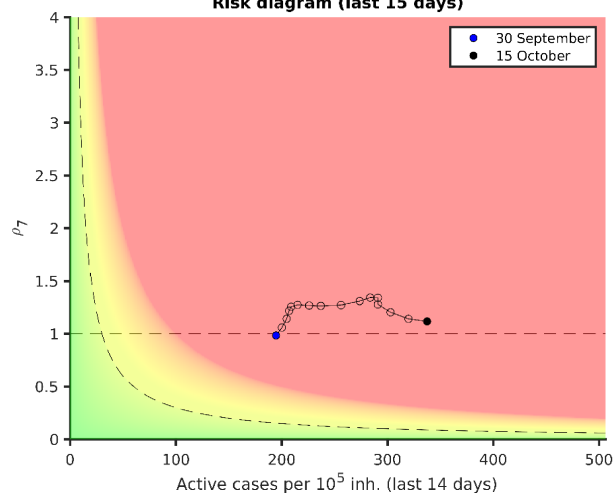
Actual  $\rho_7 = 1.1$



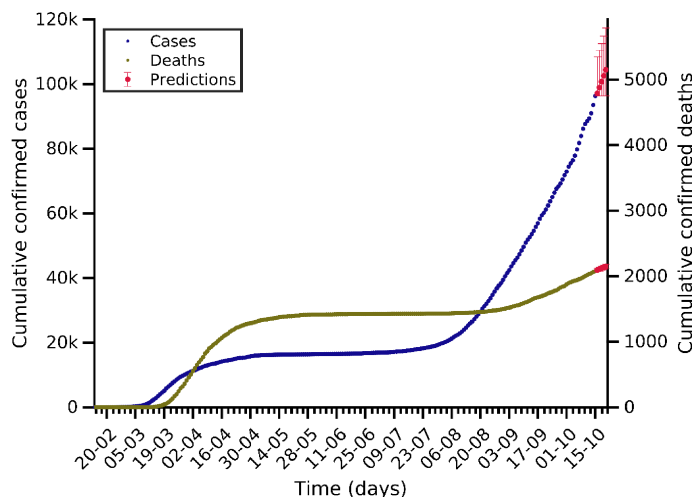
Risk diagram



Risk diagram (last 15 days)



# Andalucia 15-10-2020. Pop: 8.4M. Cumulative incidence: 1145/10<sup>5</sup>

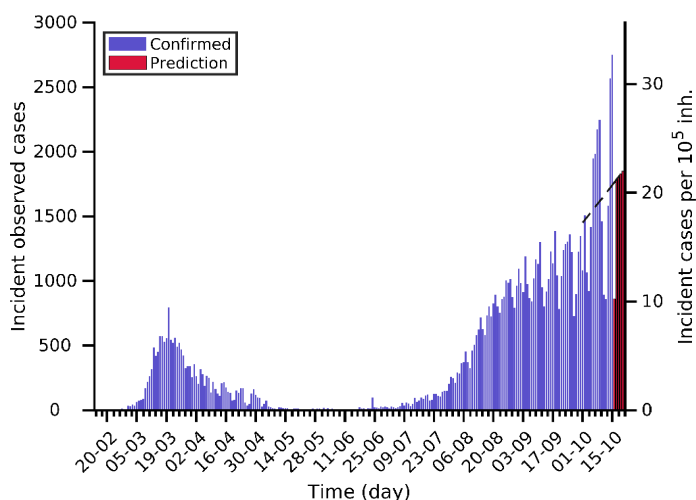


Predictions for next days

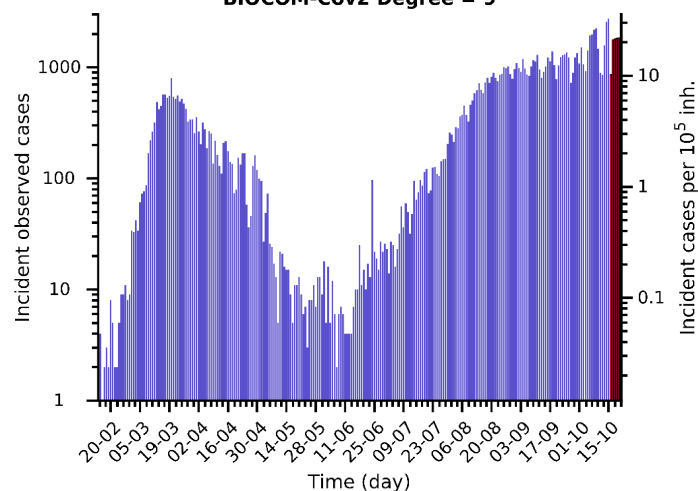
Day	Number of cases	95% Confidence Interval
16-10-2020	97167 (+861)	[ 96306 - 108472 ]
18-10-2020	100759 (+1807)	[ 96306 - 112575 ]
20-10-2020	104437 (+1850)	[ 96306 - 117409 ]

Current indicators

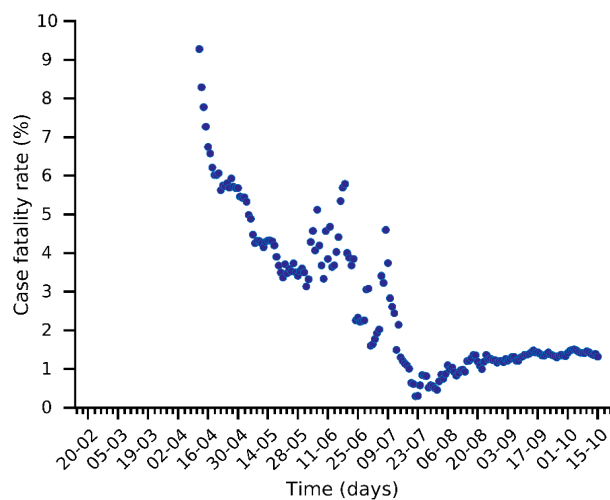
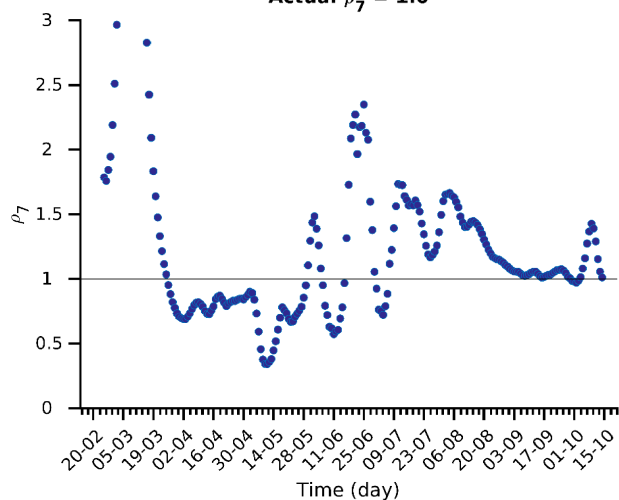
A <sub>14</sub>	EPG	CFR
278	281	1.32 %



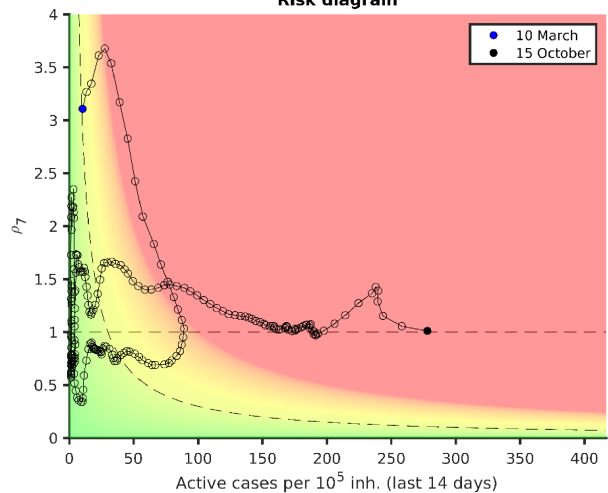
BIOCOM-Cov2 Degree = 9



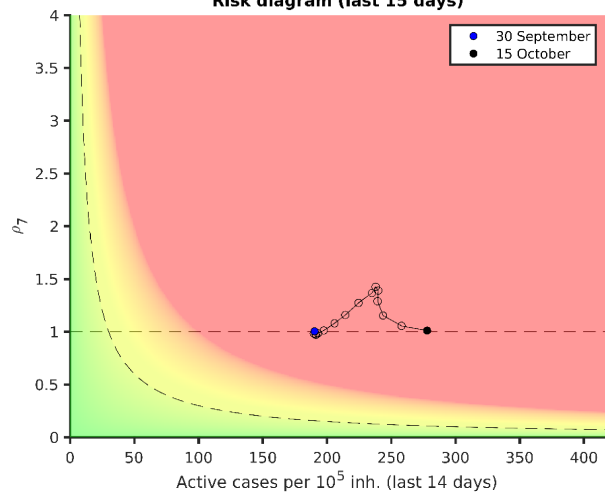
Actual  $\rho_7 = 1.0$



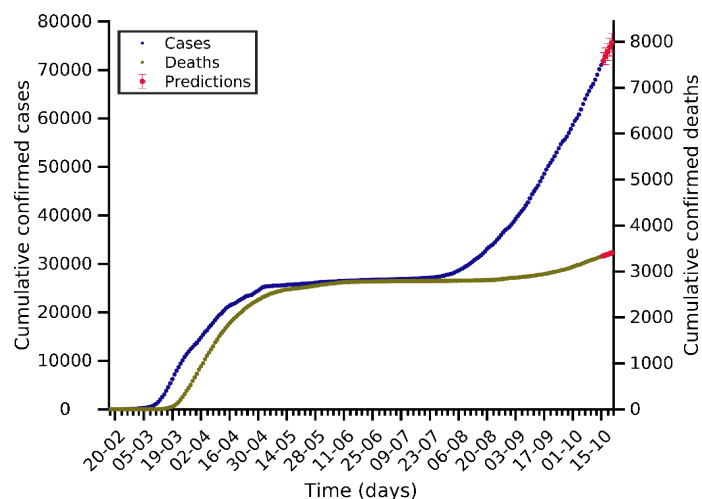
Risk diagram



Risk diagram (last 15 days)



# Castilla Leon 15-10-2020. Pop: 2.4M. Cumulative incidence: 2961/10<sup>5</sup>

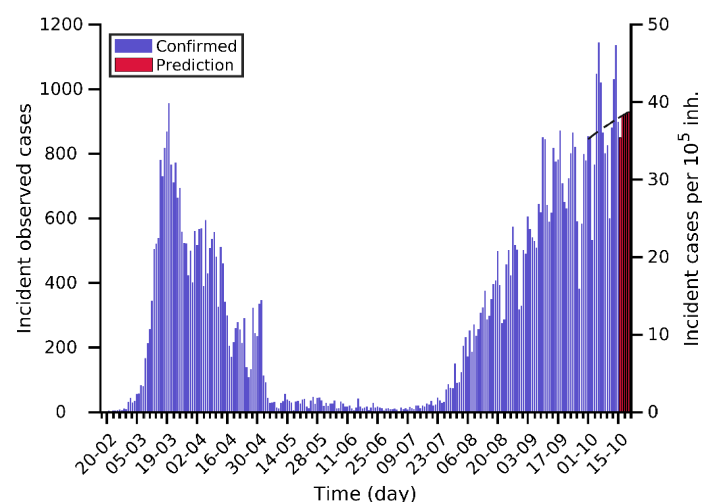


Predictions for next days

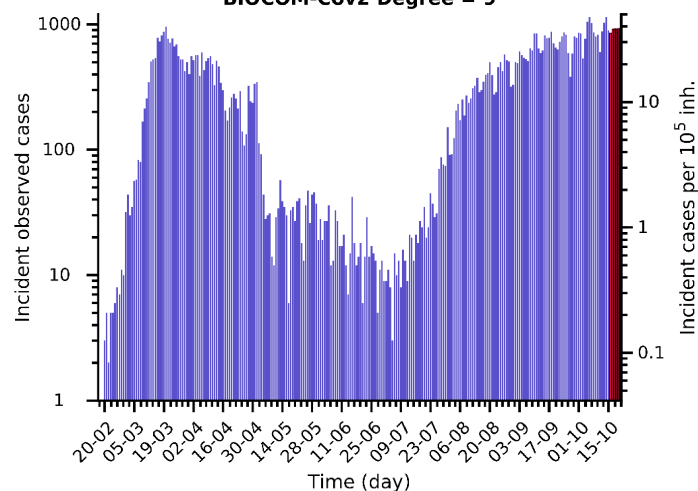
Day	Number of cases	95% Confidence Interval
16-10-2020	71908 (+850)	[ 71058 - 73586 ]
18-10-2020	73748 (+922)	[ 71999 - 75497 ]
20-10-2020	75604 (+930)	[ 73701 - 77507 ]

Current indicators

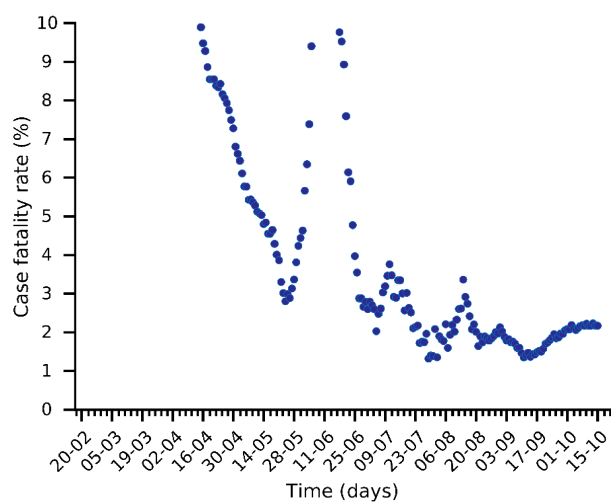
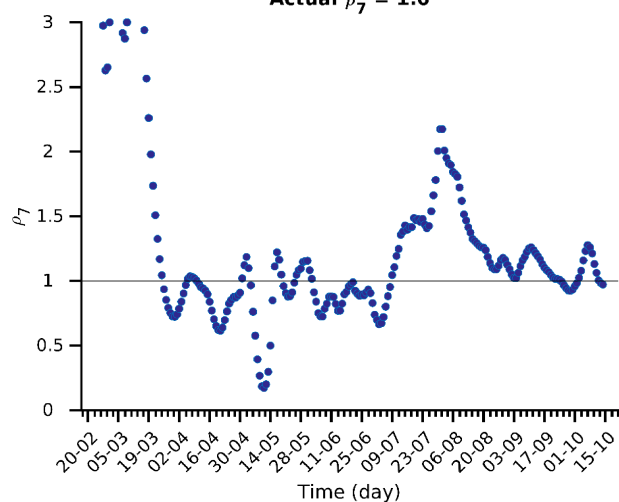
A <sub>14</sub>	EPG	CFR
517	502	2.17 %



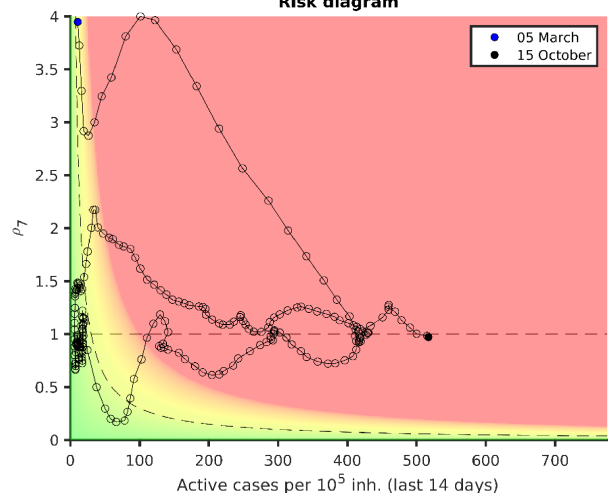
BIOCOM-Cov2 Degree = 9



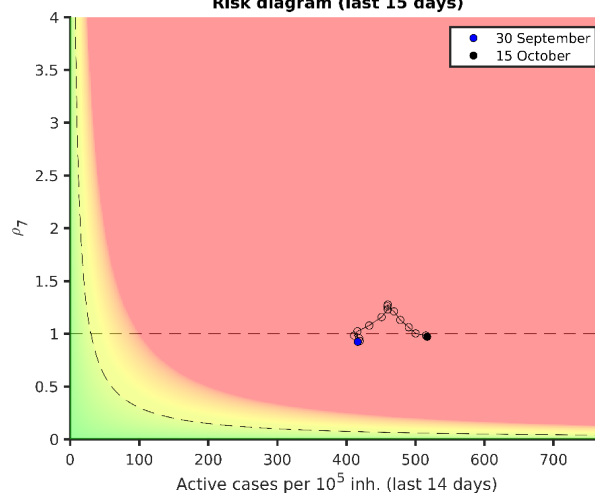
Actual  $\rho_7 = 1.0$



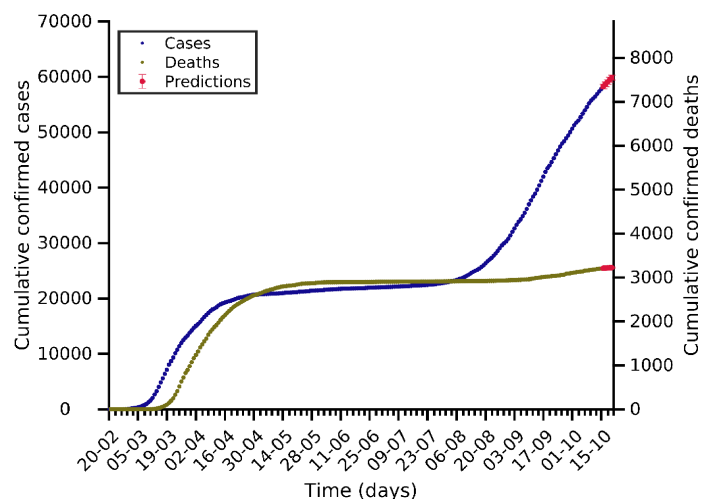
Risk diagram



Risk diagram (last 15 days)



# Castilla-La Mancha 15-10-2020. Pop: 2.0M. Cumulative incidence: 2844/10<sup>5</sup>

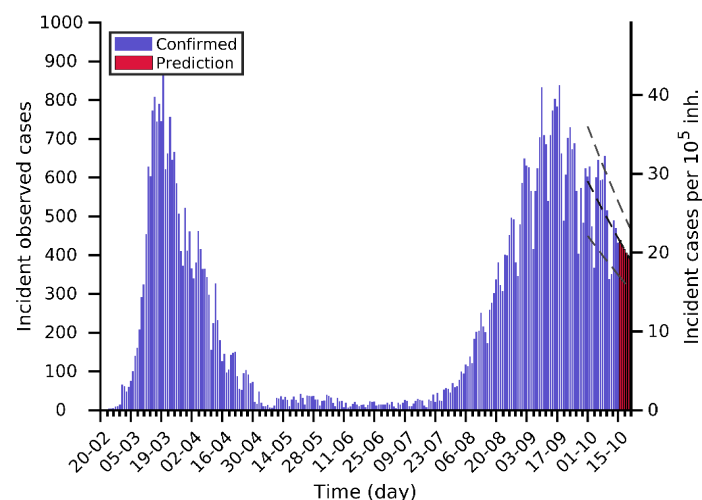


Predictions for next days

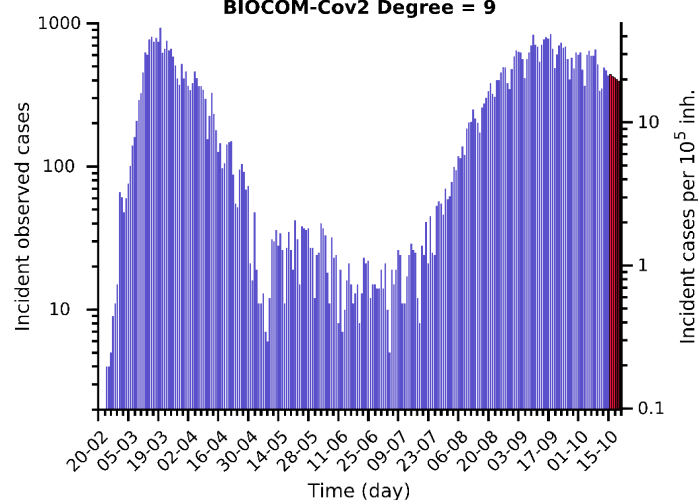
Day	Number of cases	95% Confidence Interval
16-10-2020	58251 (+439)	[ 57843 - 58658 ]
18-10-2020	59091 (+415)	[ 58669 - 59512 ]
20-10-2020	59893 (+397)	[ 59444 - 60342 ]

Current indicators

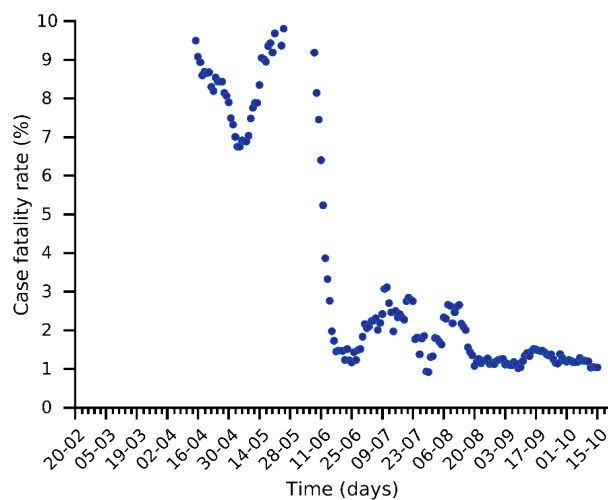
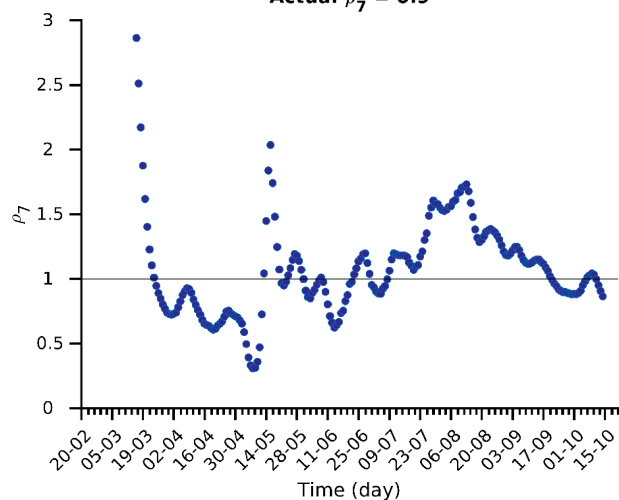
A <sub>14</sub>	EPG	CFR
352	304	1.04 %



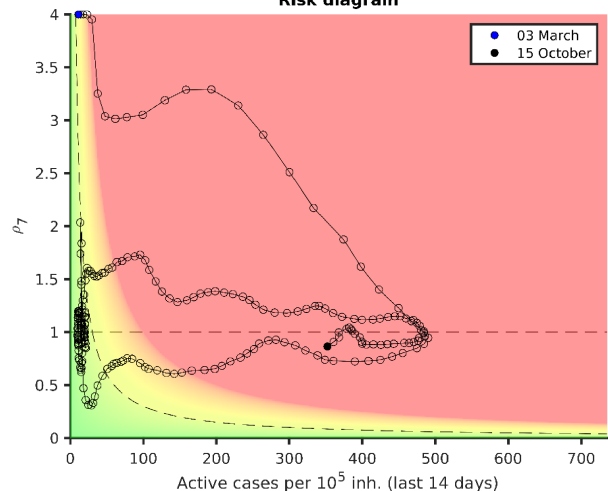
BIOCOM-Cov2 Degree = 9



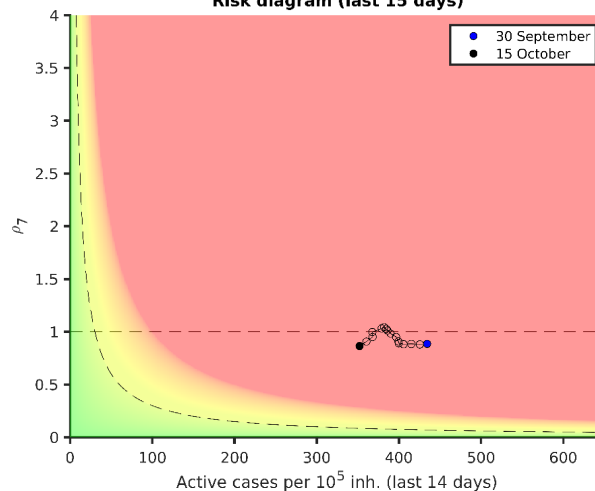
Actual  $\rho_7 = 0.9$



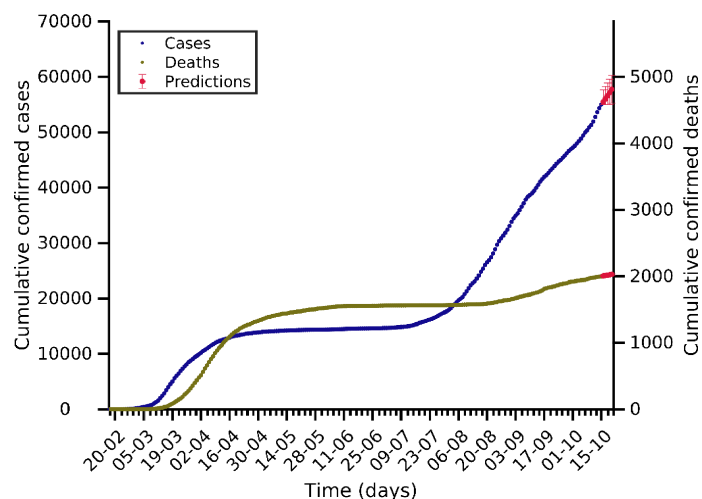
Risk diagram



Risk diagram (last 15 days)



# Euskadi 15-10-2020. Pop: 2.2M. Cumulative incidence: 2492/10<sup>5</sup>

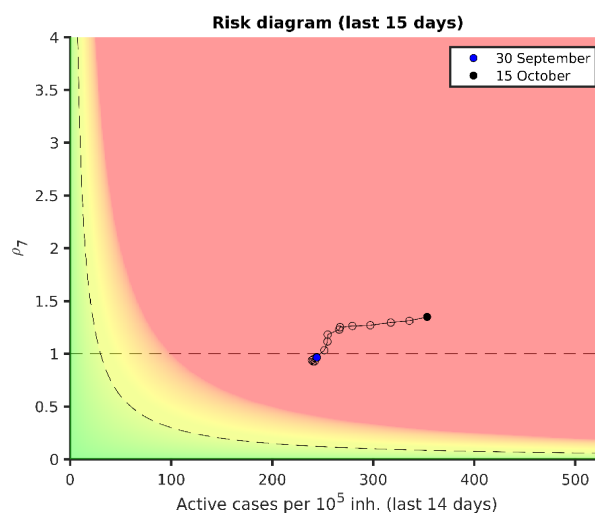
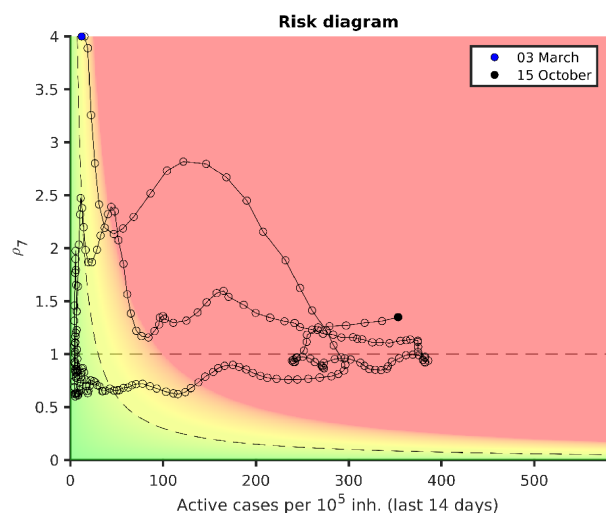
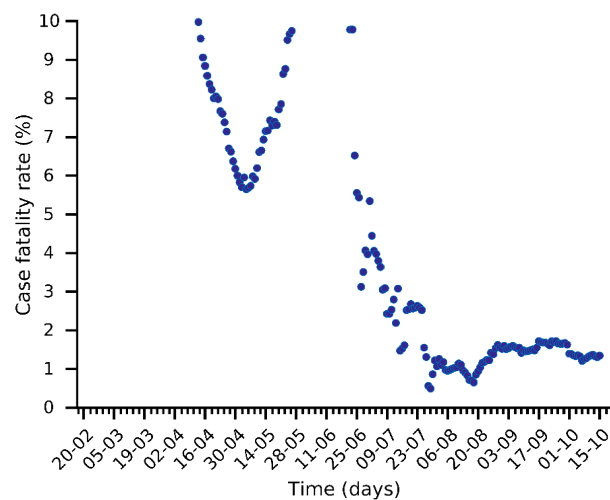
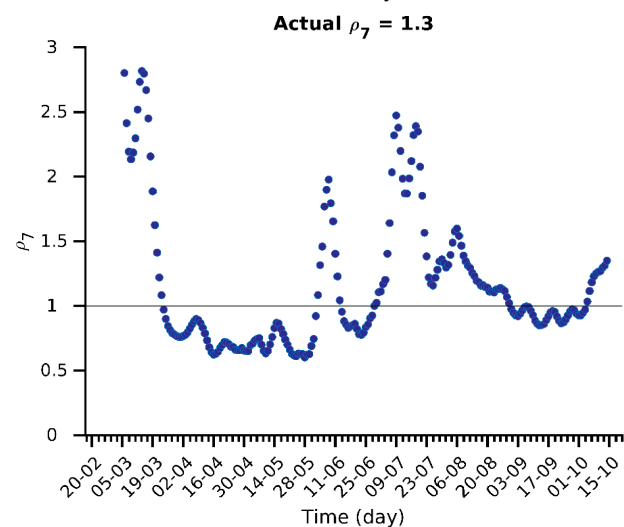
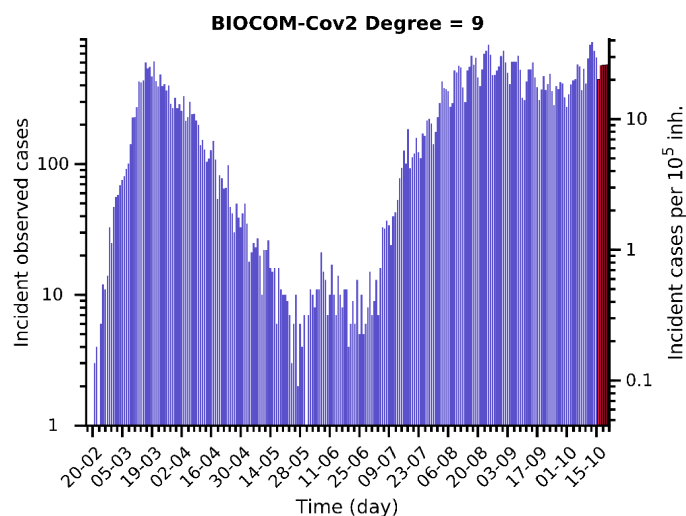
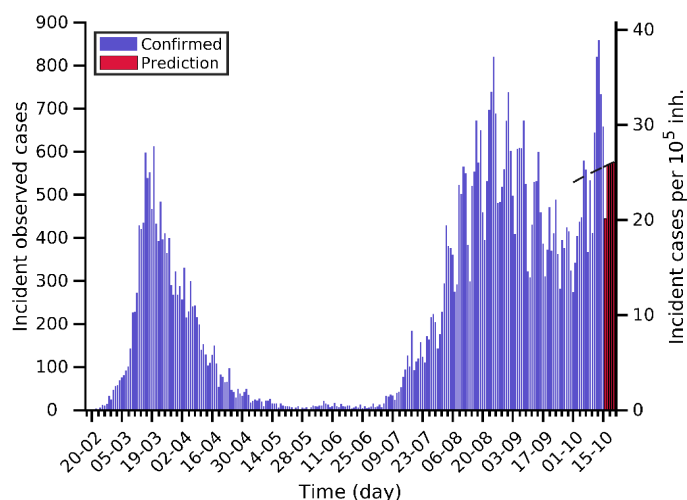


Predictions for next days

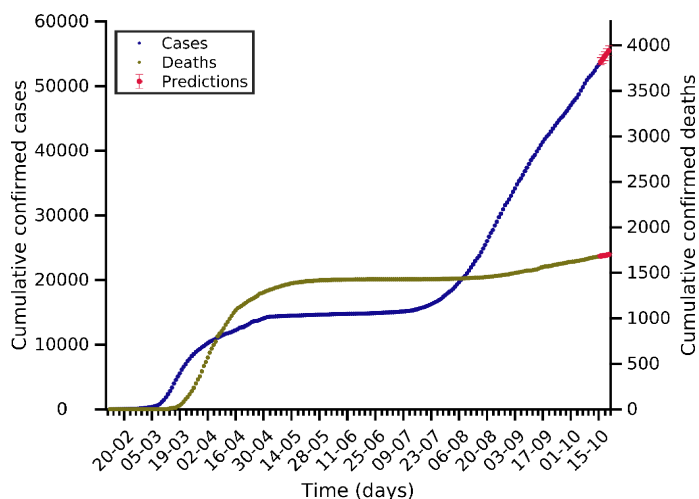
Day	Number of cases	95% Confidence Interval
16-10-2020	55468 (+445)	[ 55023 - 57672 ]
18-10-2020	56608 (+571)	[ 55023 - 58904 ]
20-10-2020	57758 (+576)	[ 55262 - 60253 ]

Current indicators

A <sub>14</sub>	EPG	CFR
353	477	1.34 %



# C Valenciana 15-10-2020. Pop: 5.0M. Cumulative incidence: 1065/10<sup>5</sup>

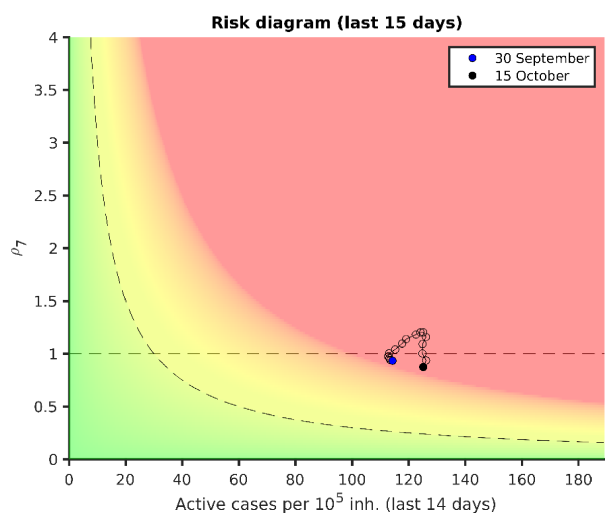
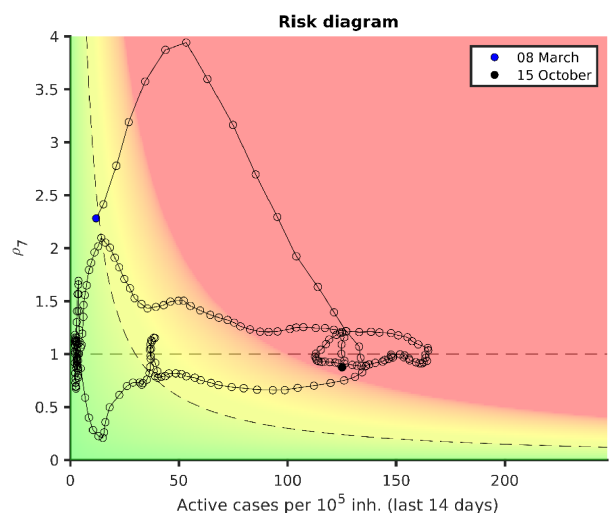
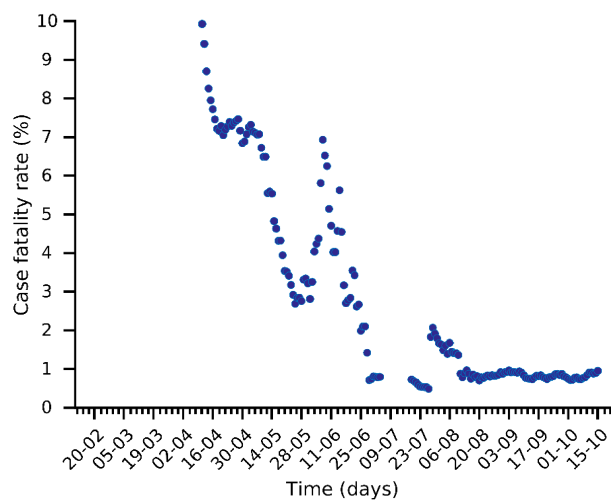
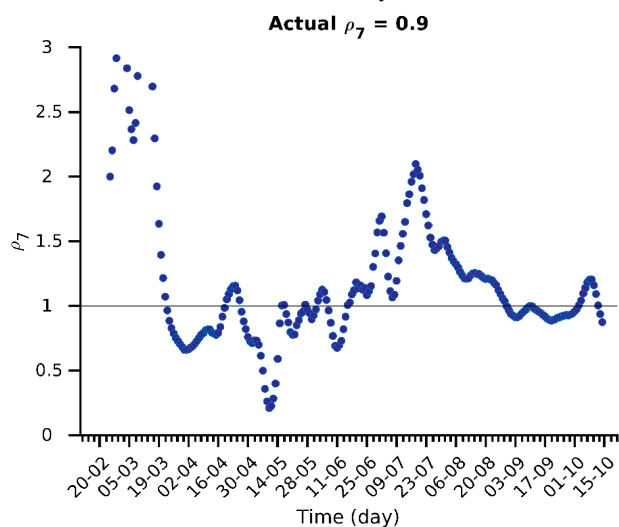
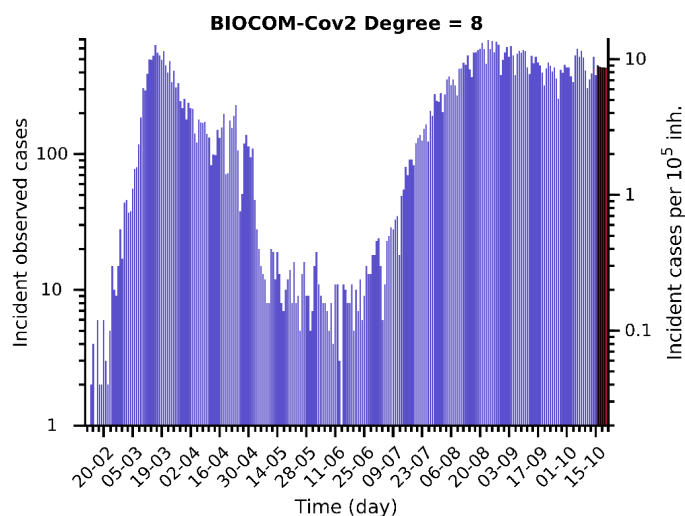
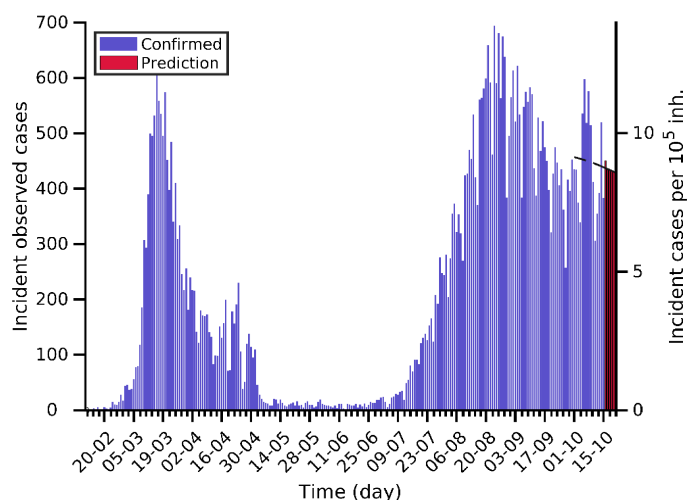


Predictions for next days

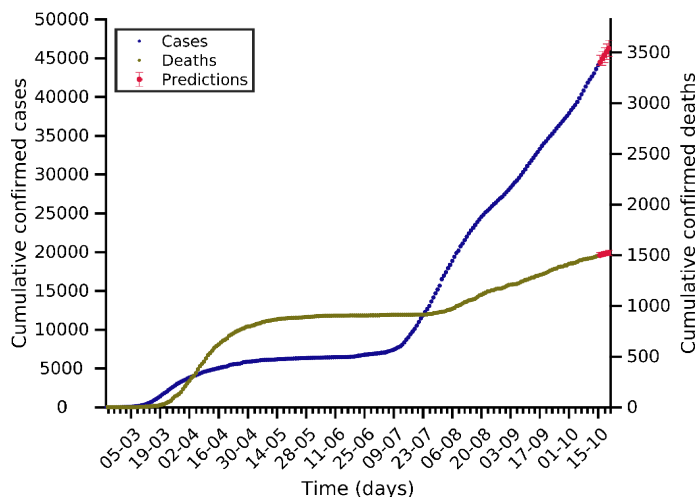
Day	Number of cases	95% Confidence Interval
16-10-2020	53749 (+450)	[ 53299 - 54407 ]
18-10-2020	54619 (+434)	[ 53936 - 55302 ]
20-10-2020	55482 (+431)	[ 54745 - 56219 ]

Current indicators

A <sub>14</sub>	EPG	CFR
125	109	0.95 %



# Aragon 15-10-2020. Pop: 1.3M. Cumulative incidence: 3342/10<sup>5</sup>

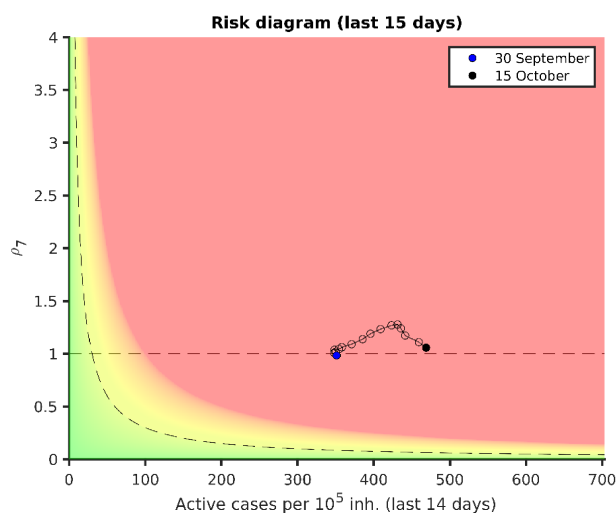
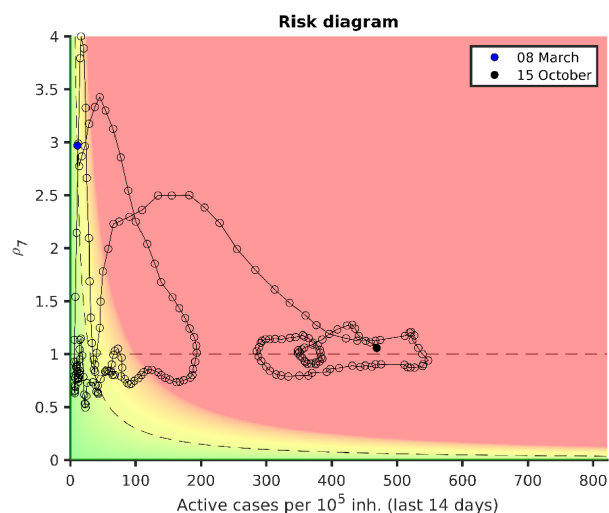
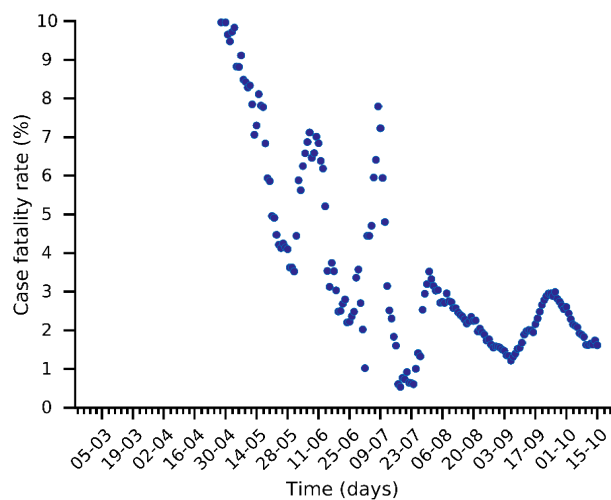
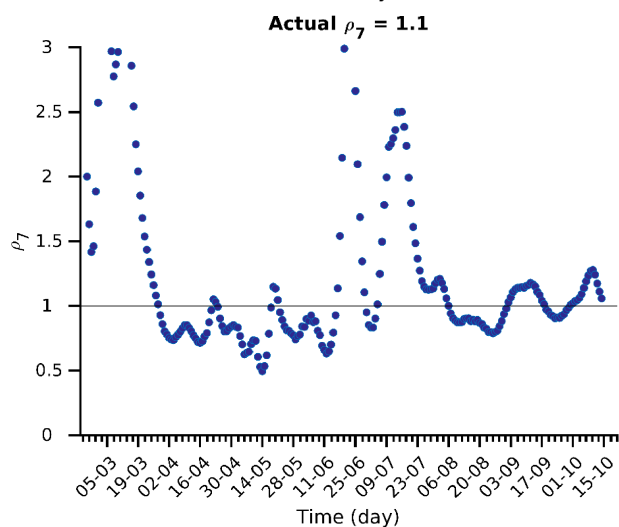
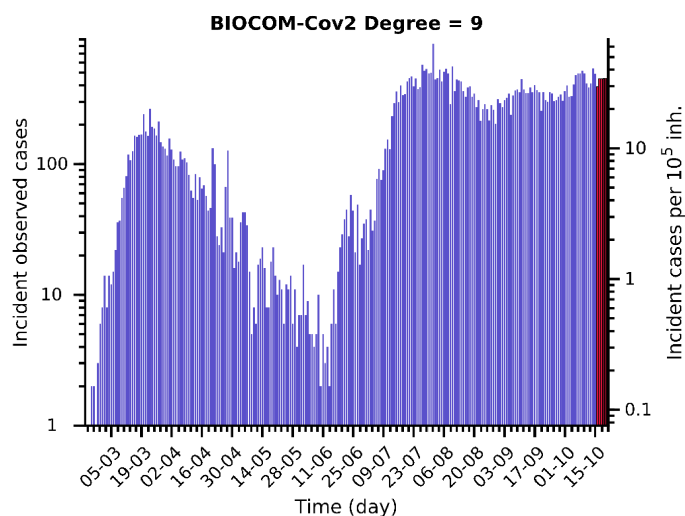
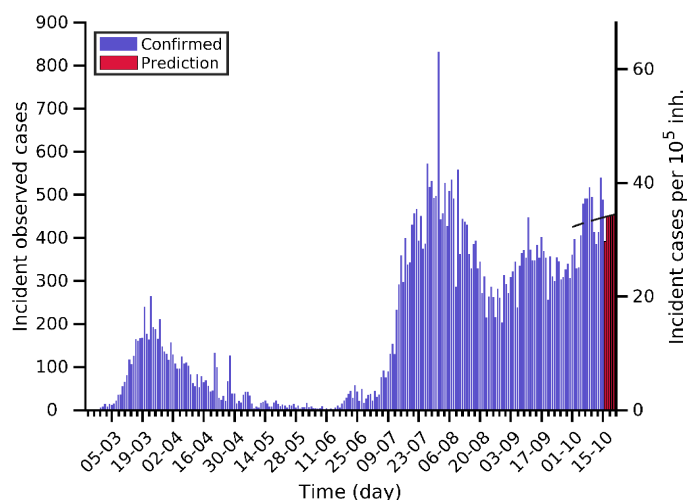


Predictions for next days

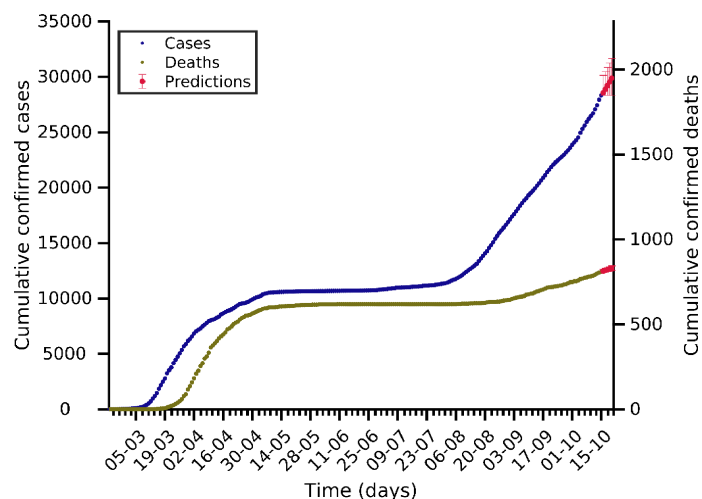
Day	Number of cases	95% Confidence Interval
16-10-2020	44489 (+392)	[ 44097 - 45408 ]
18-10-2020	45390 (+451)	[ 44433 - 46347 ]
20-10-2020	46296 (+454)	[ 45258 - 47335 ]

Current indicators

A <sub>14</sub>	EPG	CFR
469	496	1.61 %



# Galicia 15-10-2020. Pop: 2.7M. Cumulative incidence: 1050/10<sup>5</sup>

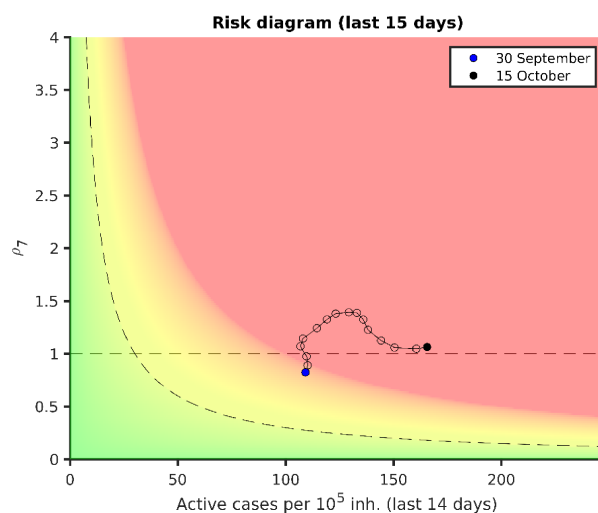
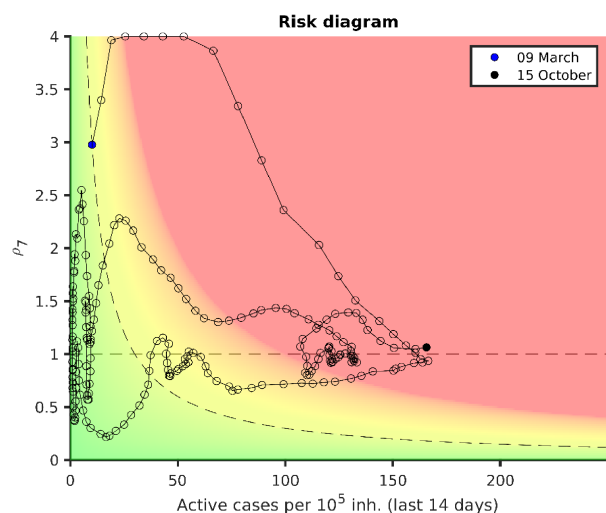
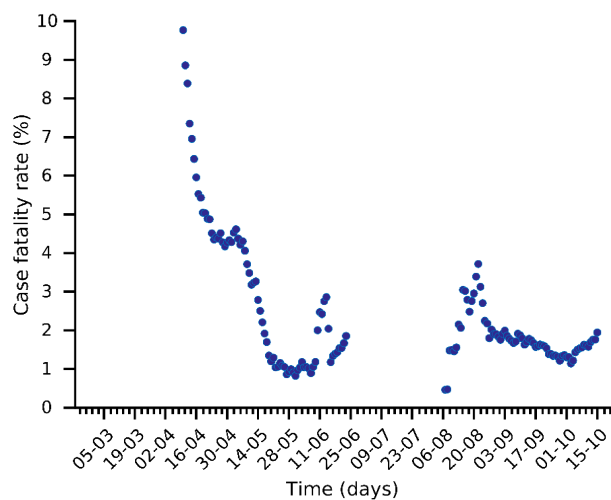
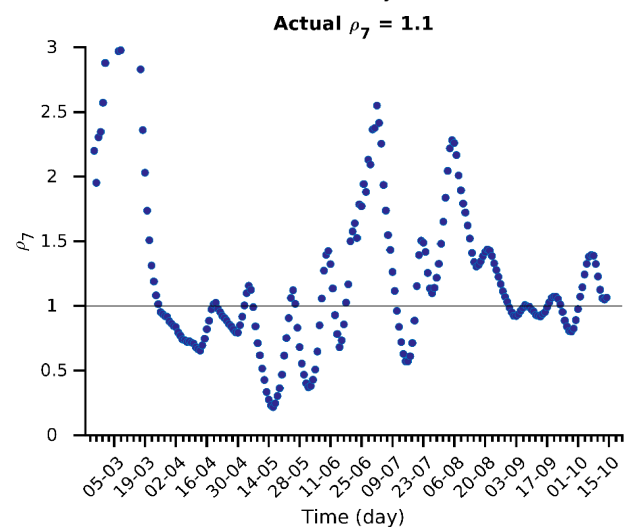
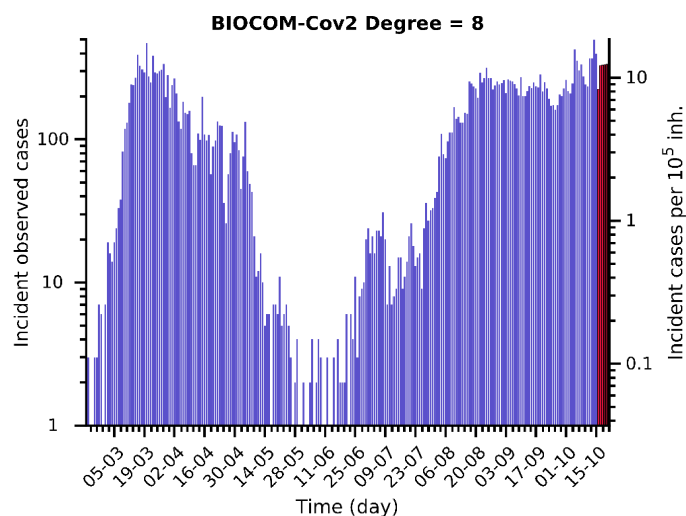
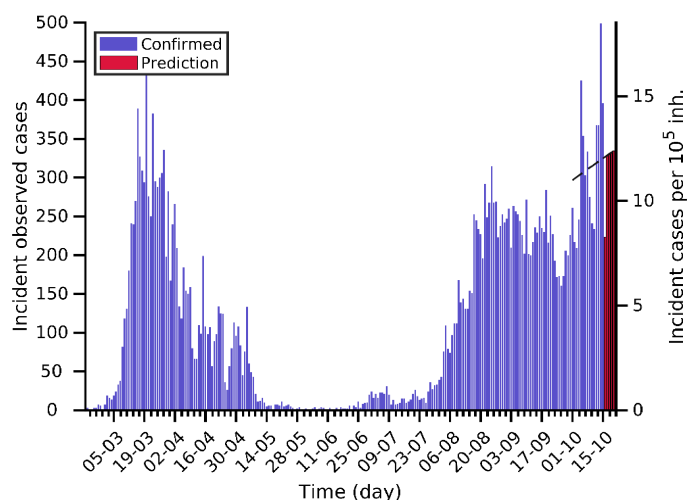


Predictions for next days

Day	Number of cases	95% Confidence Interval
16-10-2020	28556 (+223)	[ 28333 - 30134 ]
18-10-2020	29216 (+331)	[ 28333 - 30860 ]
20-10-2020	29883 (+335)	[ 28333 - 31673 ]

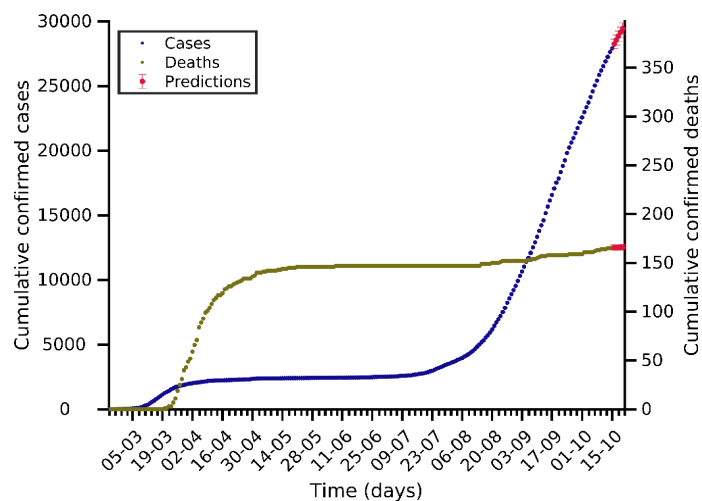
Current indicators

A <sub>14</sub>	EPG	CFR
166	176	1.94 %





# Murcia 15-10-2020. Pop: 1.5M. Cumulative incidence: 1868/10<sup>5</sup>

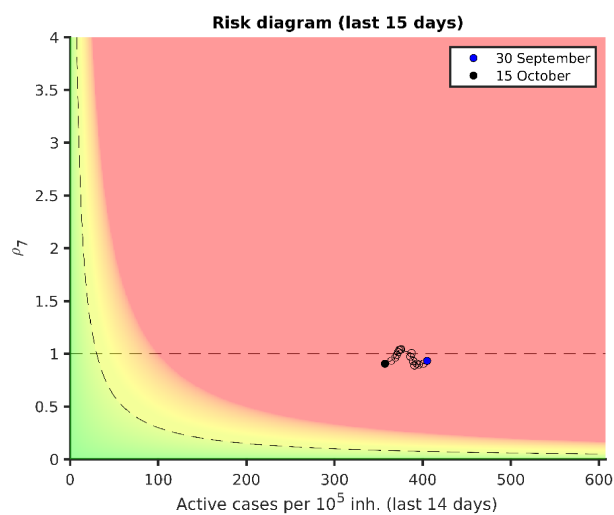
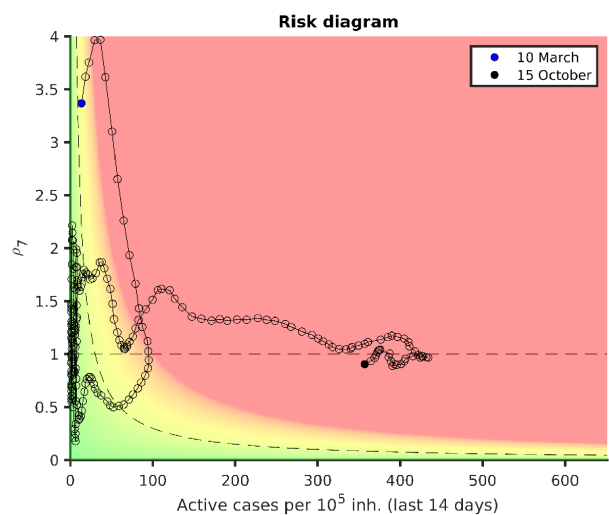
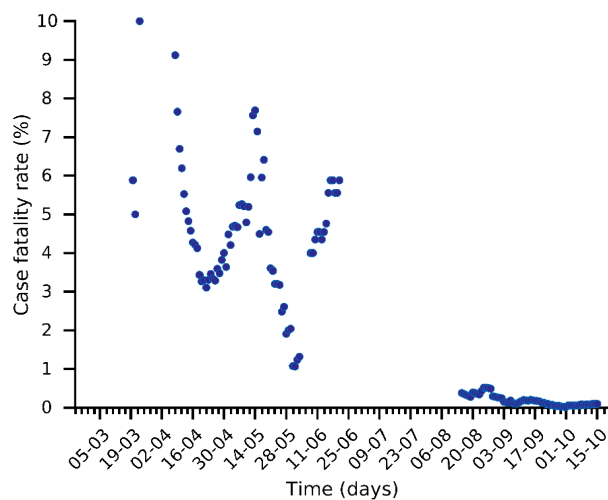
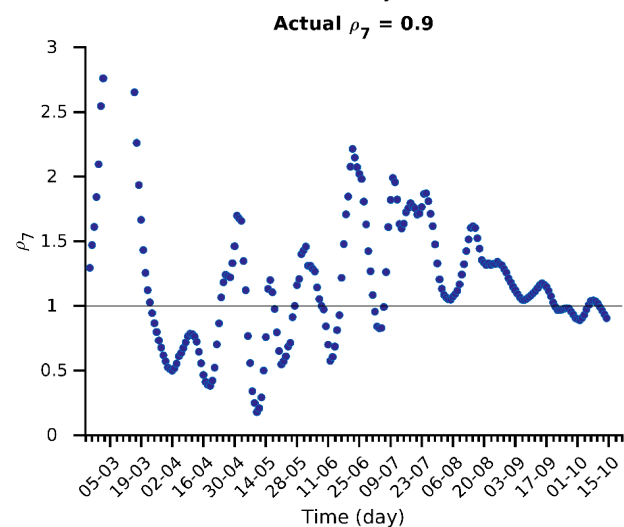
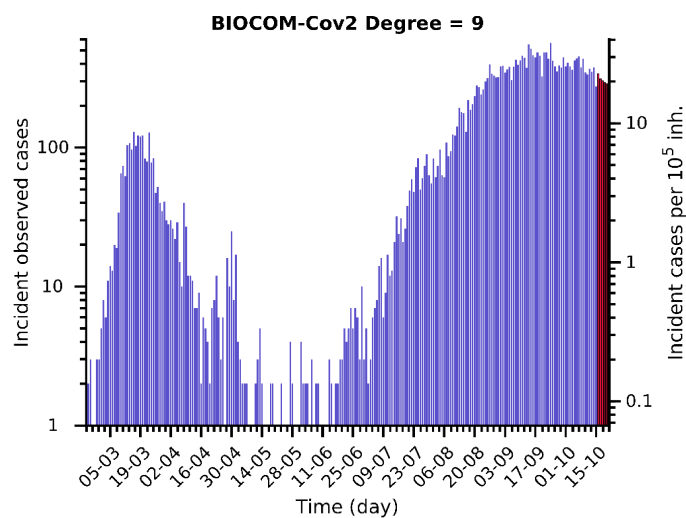
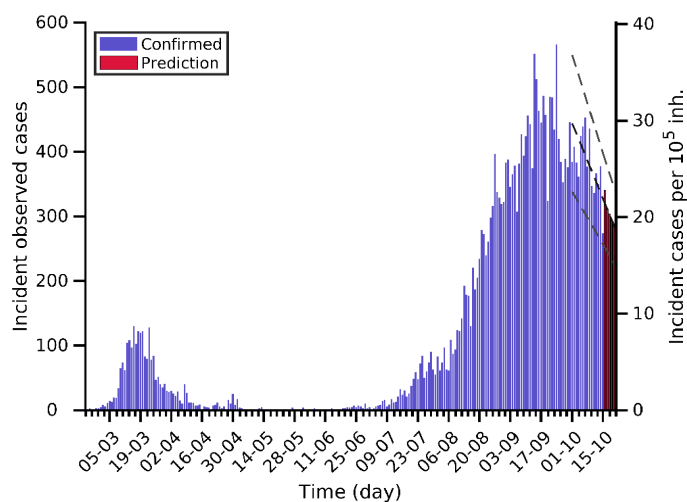


Predictions for next days

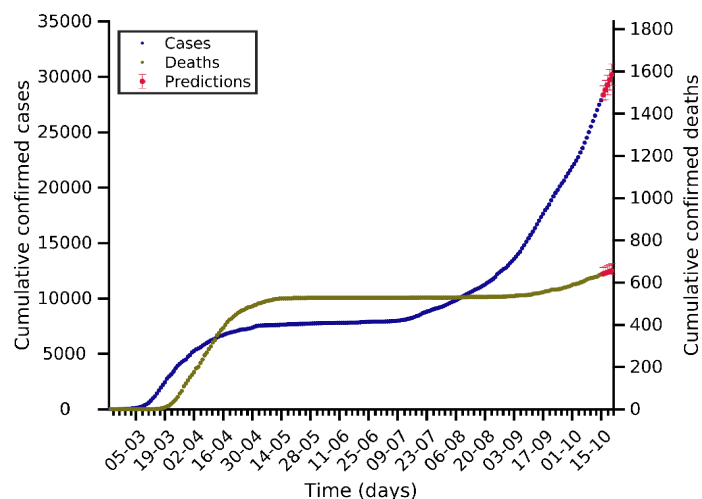
Day	Number of cases	95% Confidence Interval
16-10-2020	28254 (+341)	[ 27913 - 28640 ]
18-10-2020	28869 (+303)	[ 28470 - 29268 ]
20-10-2020	29451 (+287)	[ 29027 - 29876 ]

Current indicators

A <sub>14</sub>	EPG	CFR
357	323	0.09 %



# Navarra 15-10-2020. Pop: 0.7M. Cumulative incidence: 4263/10<sup>5</sup>

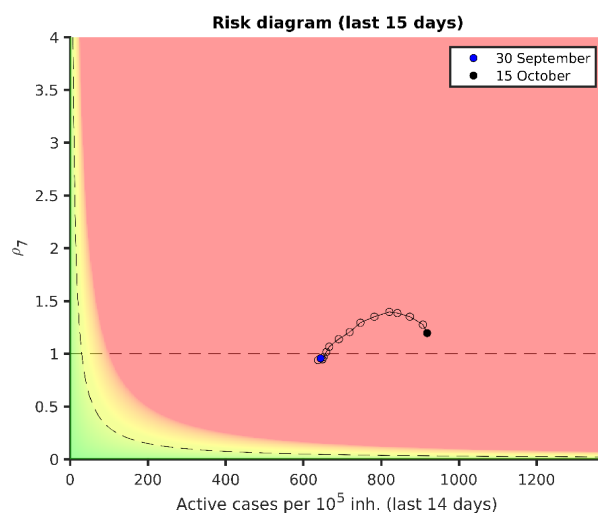
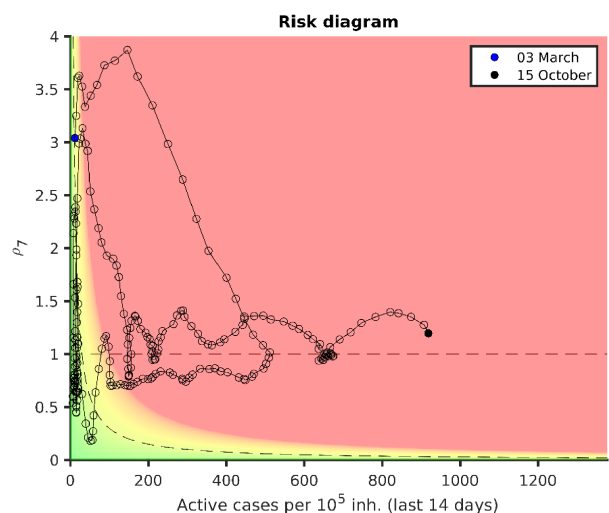
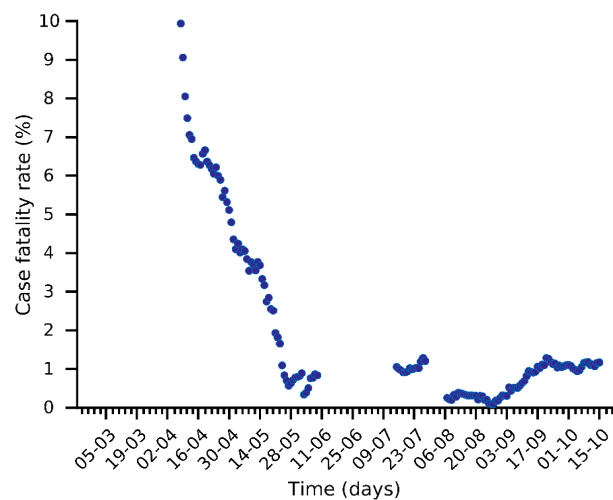
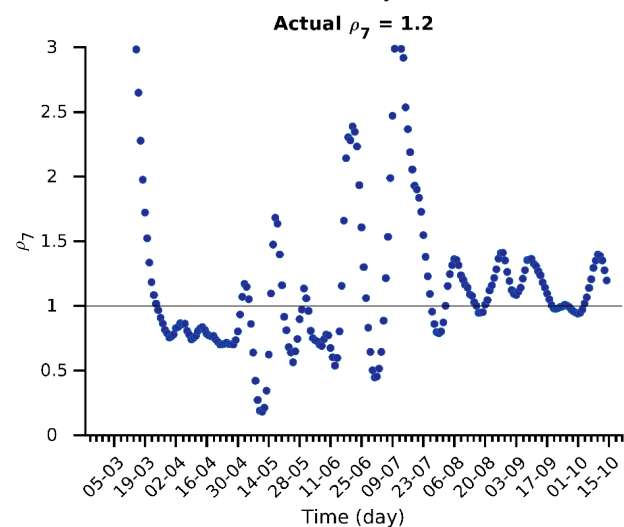
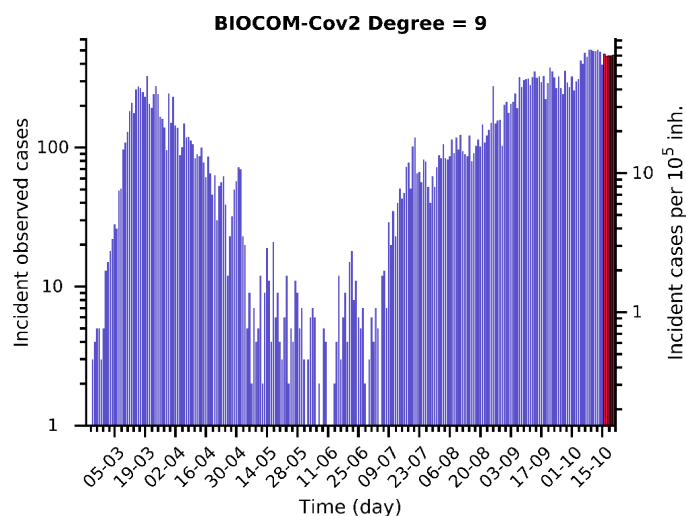
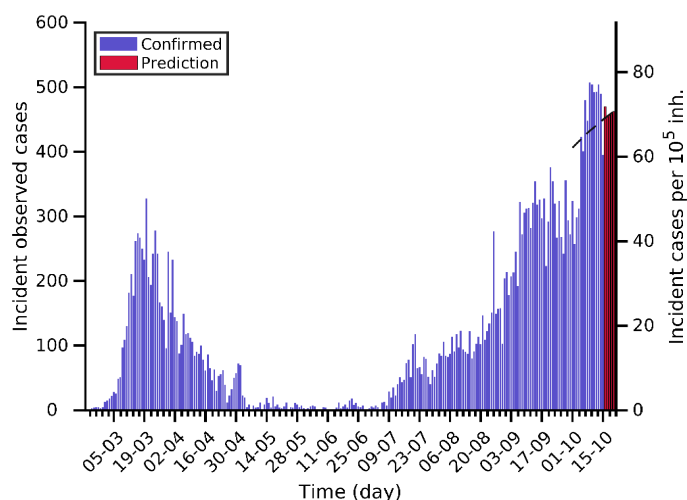


Predictions for next days

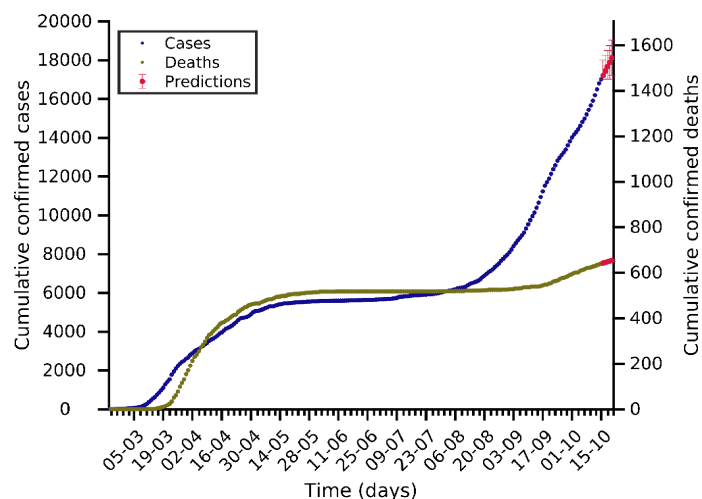
Day	Number of cases	95% Confidence Interval
16-10-2020	28360 (+470)	[ 27890 - 29208 ]
18-10-2020	29272 (+457)	[ 28388 - 30157 ]
20-10-2020	30195 (+462)	[ 29230 - 31160 ]

Current indicators

A <sub>14</sub>	EPG	CFR
918	1099	1.17 %



# Extremadura 15-10-2020. Pop: 1.1M. Cumulative incidence: 1594/10<sup>5</sup>

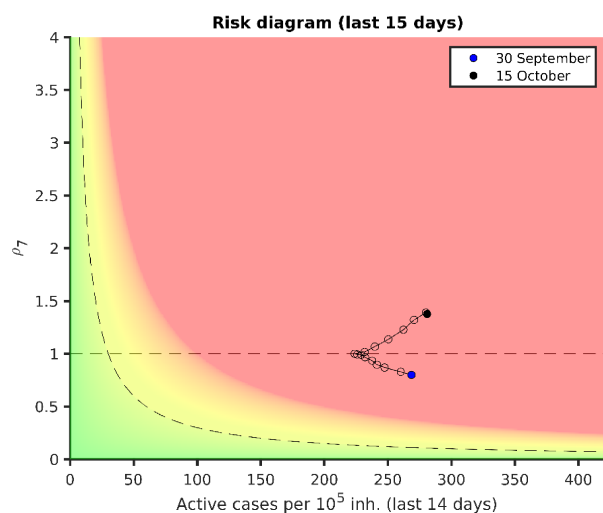
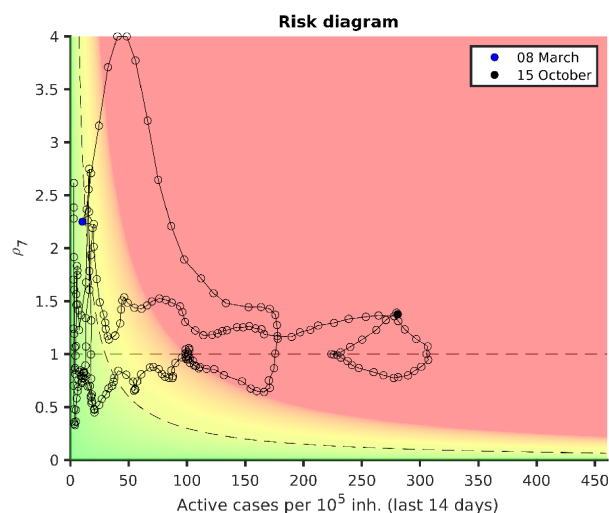
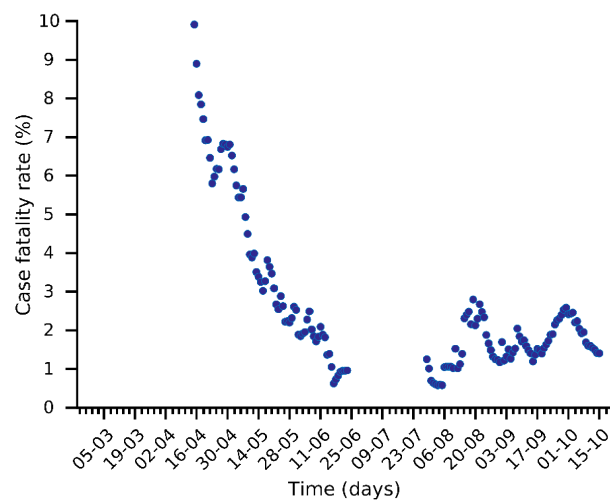
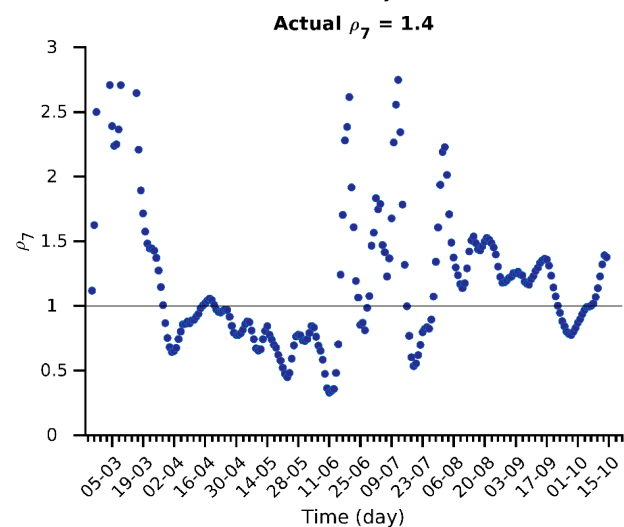
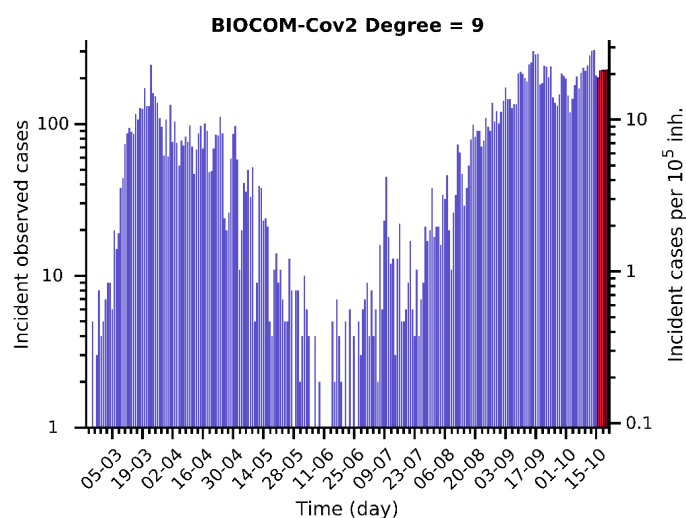
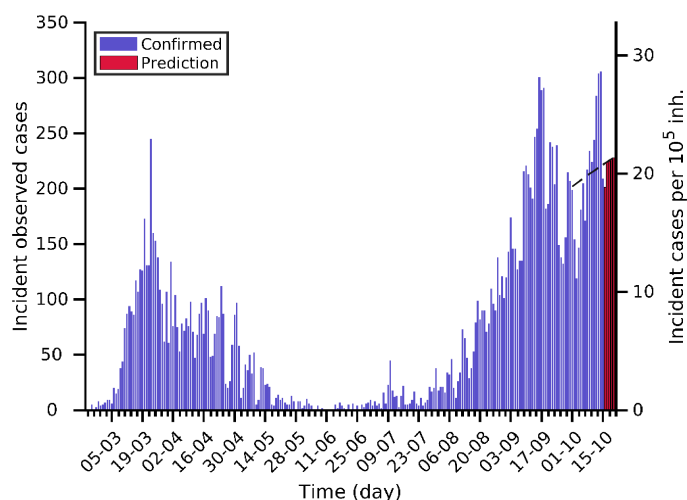


Predictions for next days

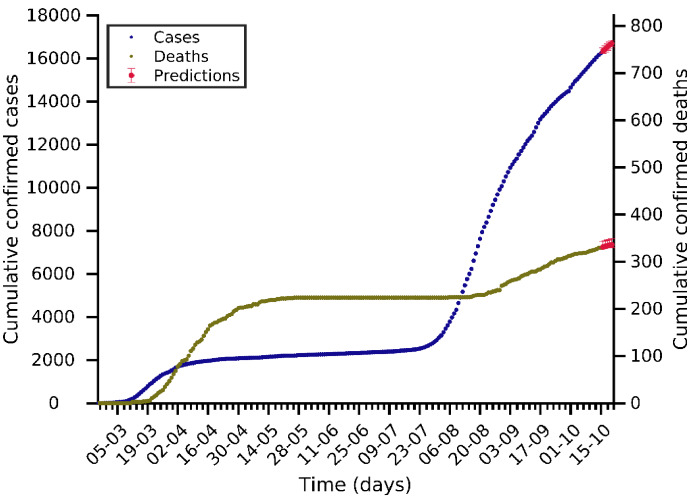
Day	Number of cases	95% Confidence Interval
16-10-2020	17218 (+201)	[ 17017 - 18019 ]
18-10-2020	17668 (+226)	[ 17017 - 18502 ]
20-10-2020	18123 (+228)	[ 17214 - 19032 ]

Current indicators

A <sub>14</sub>	EPG	CFR
281	387	1.40 %

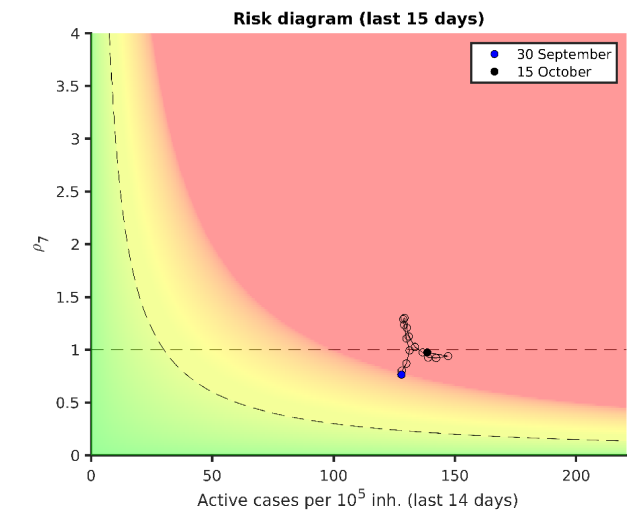
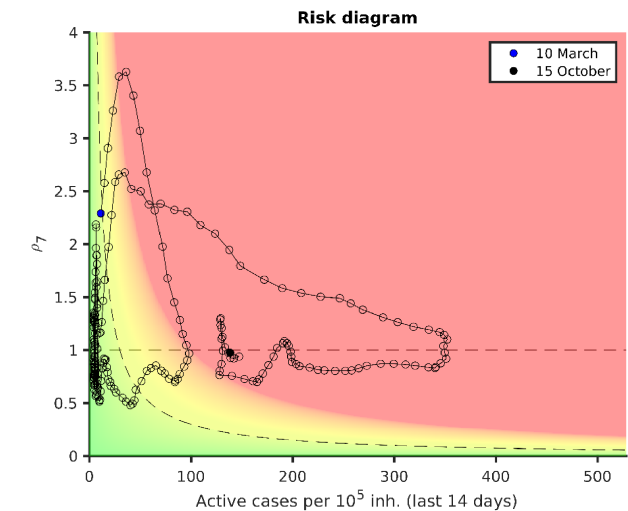
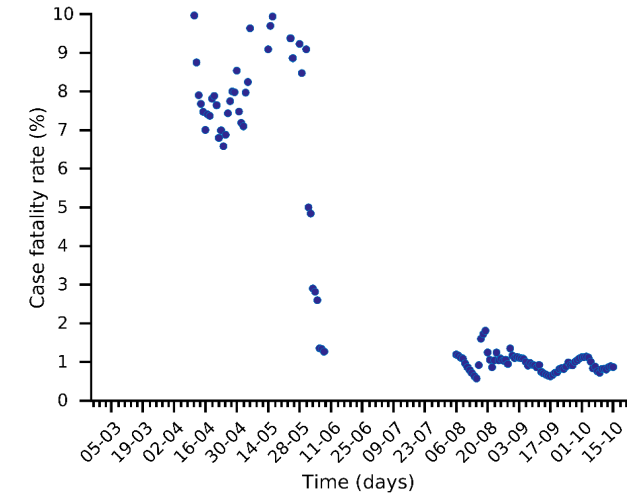
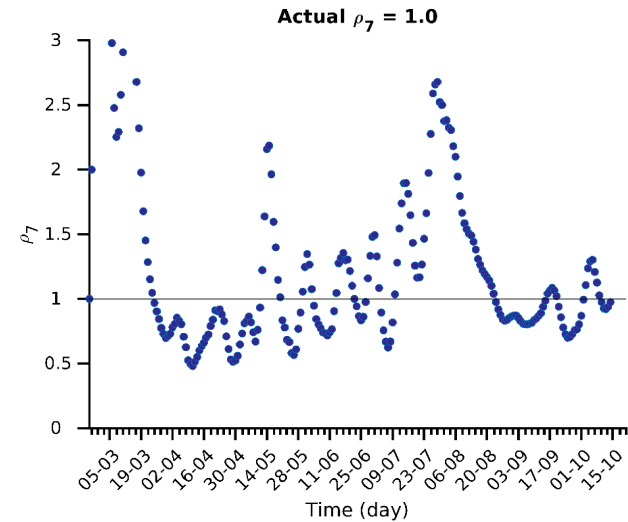
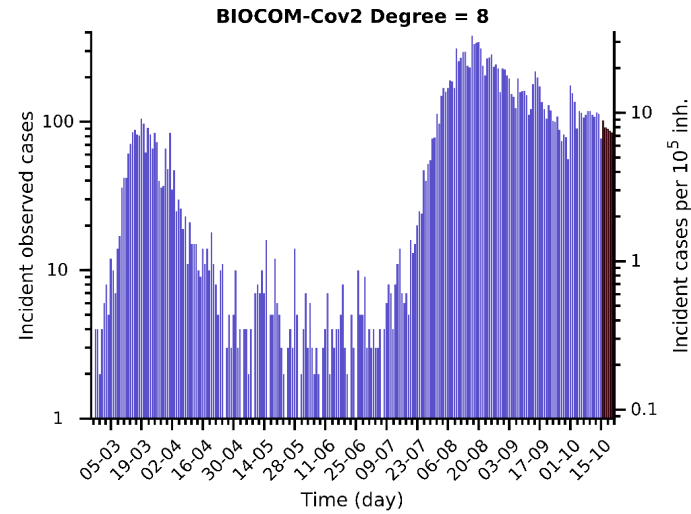
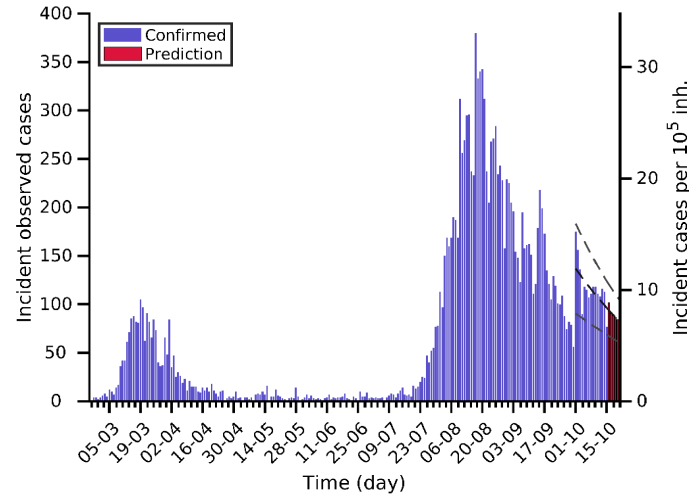


Baleares 15-10-2020. Pop: 1.1M. Cumulative incidence: 1414/10<sup>5</sup>

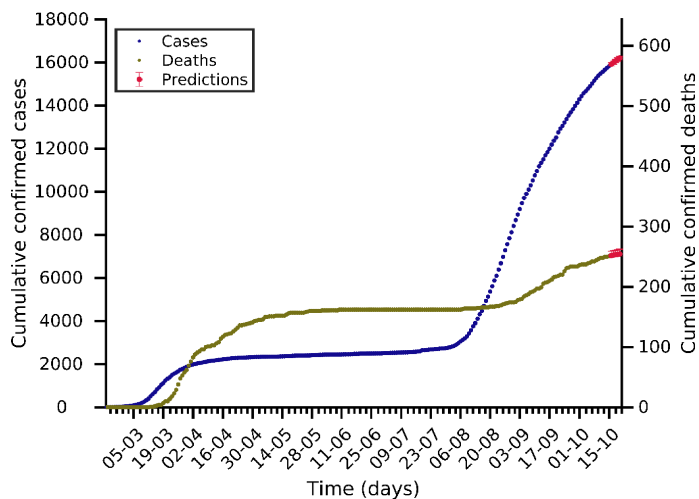


Predictions for next days		
Day	Number of cases	95% Confidence Interval
16-10-2020	16351 (+101)	[ 16250 - 16491 ]
18-10-2020	16532 (+89)	[ 16388 - 16675 ]
20-10-2020	16702 (+84)	[ 16550 - 16855 ]

Current indicators		
A <sub>14</sub>	EPG	CFR
139	135	0.87 %



# Canarias 15-10-2020. Pop: 2.2M. Cumulative incidence: 735/10<sup>5</sup>

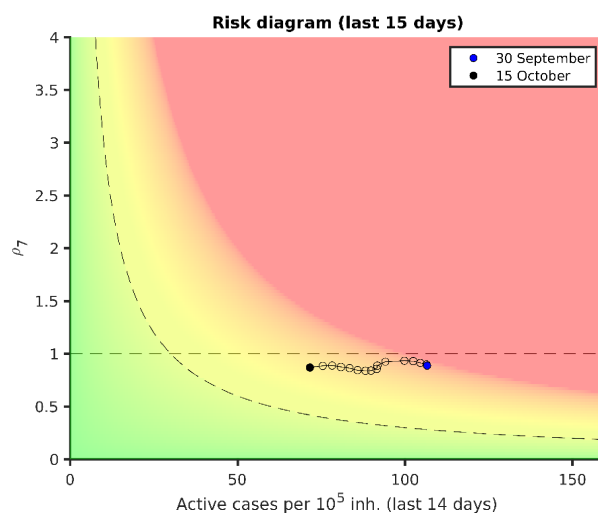
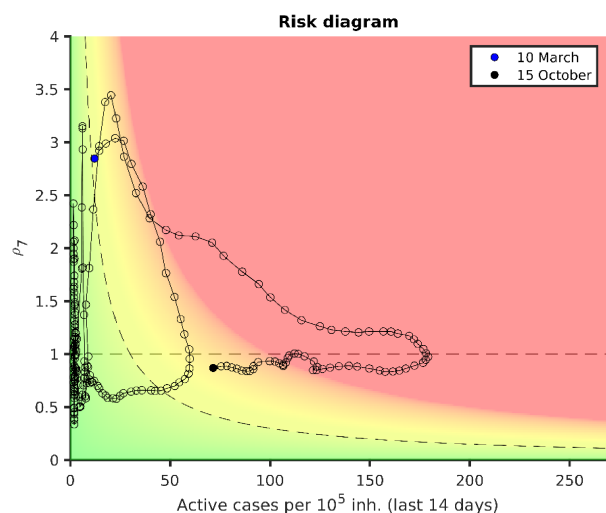
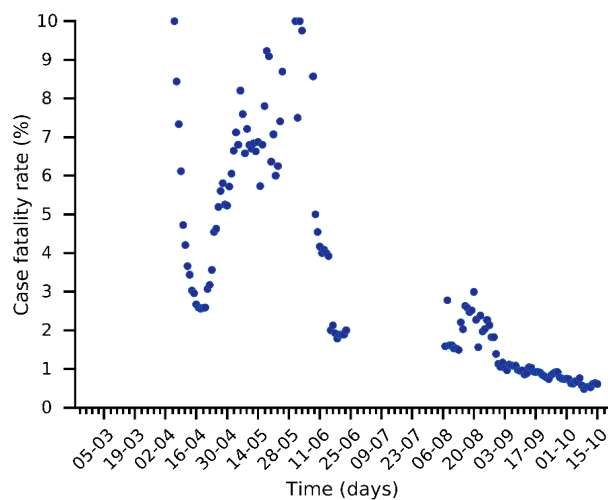
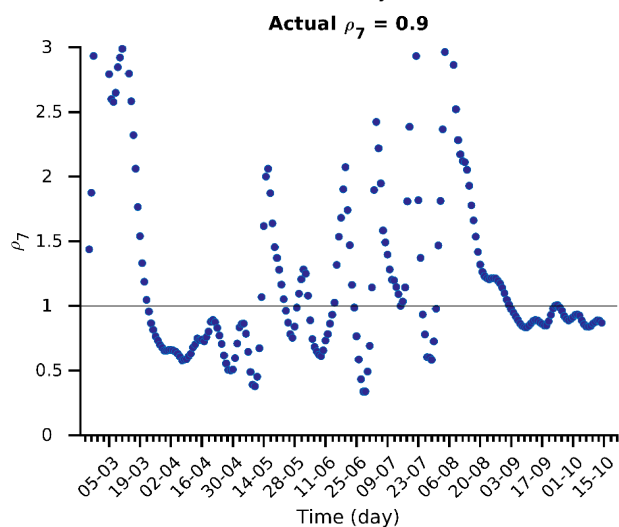
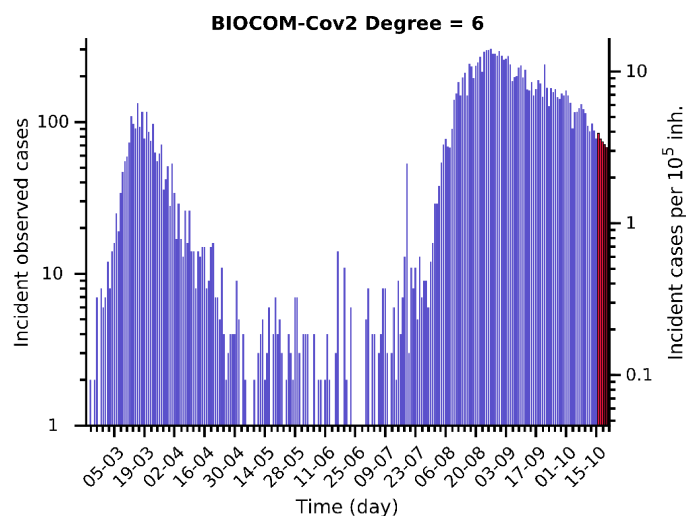
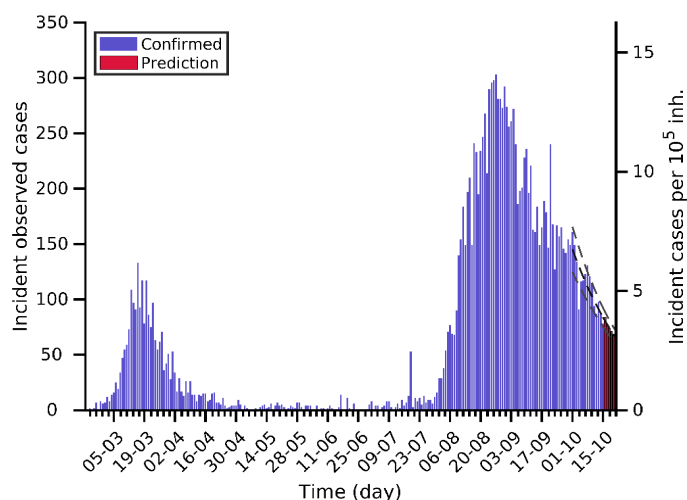


Predictions for next days

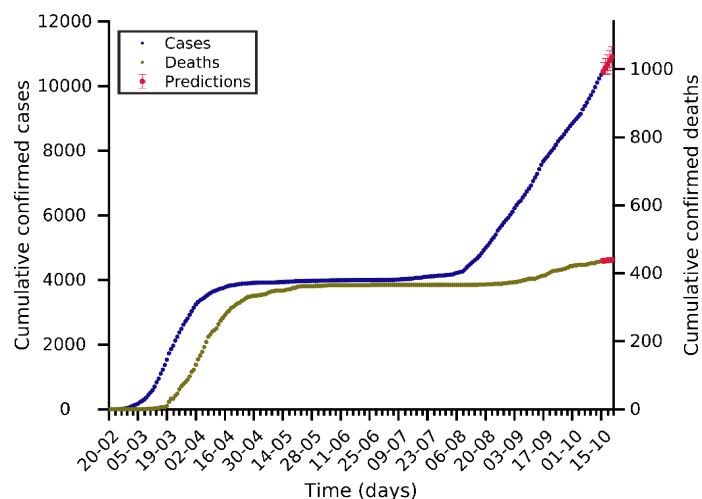
Day	Number of cases	95% Confidence Interval
16-10-2020	15922 (+84)	[ 15844 - 16000 ]
18-10-2020	16073 (+74)	[ 15993 - 16154 ]
20-10-2020	16213 (+68)	[ 16128 - 16297 ]

Current indicators

A <sub>14</sub>	EPG	CFR
72	62	0.61 %



# La Rioja 15-10-2020. Pop: 0.3M. Cumulative incidence: 3268/10<sup>5</sup>

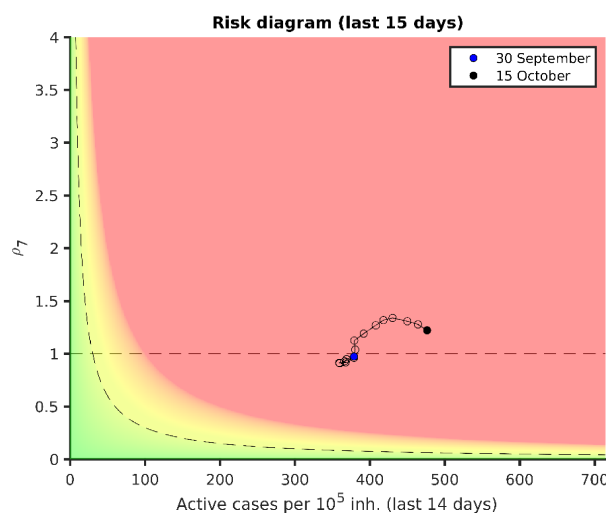
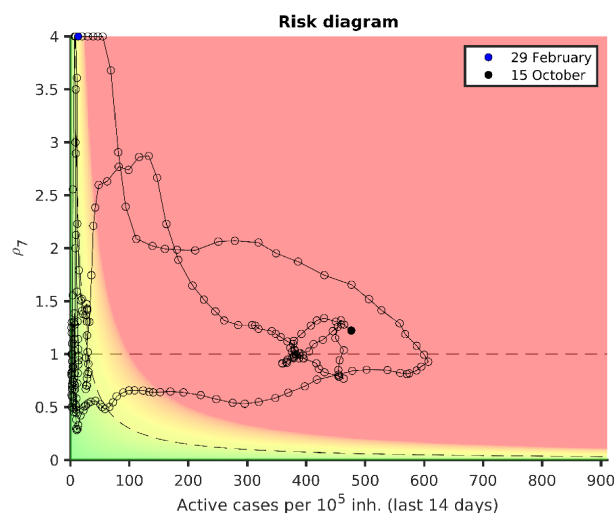
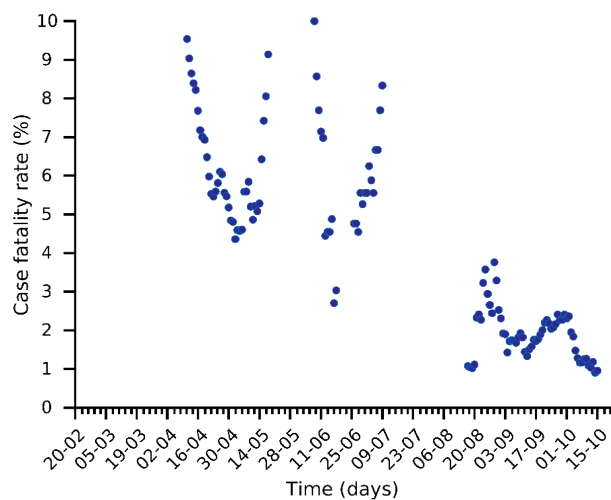
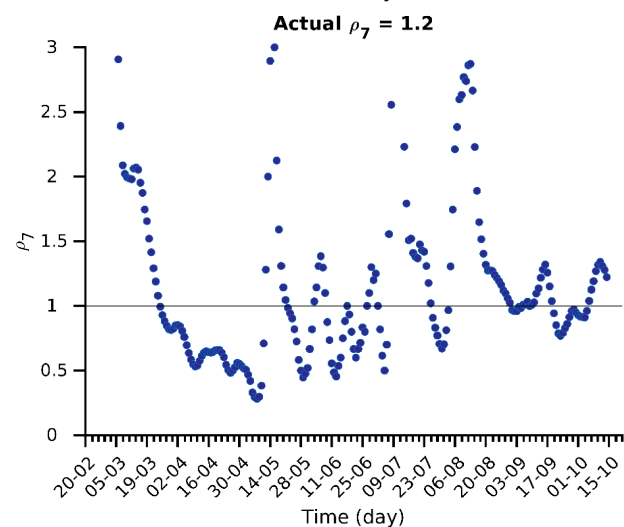
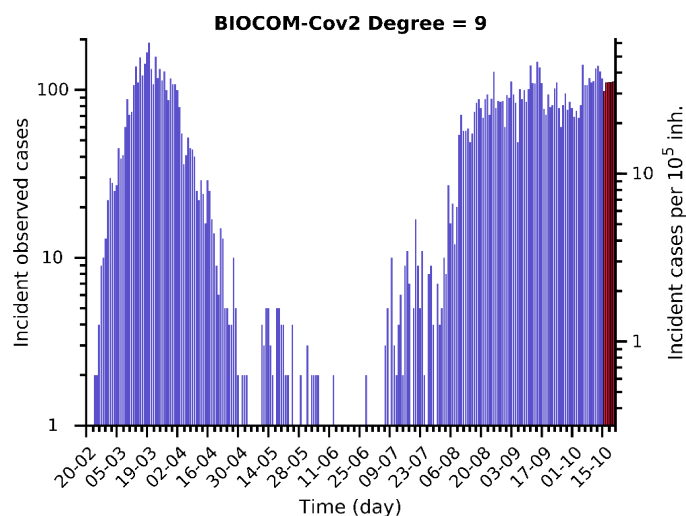
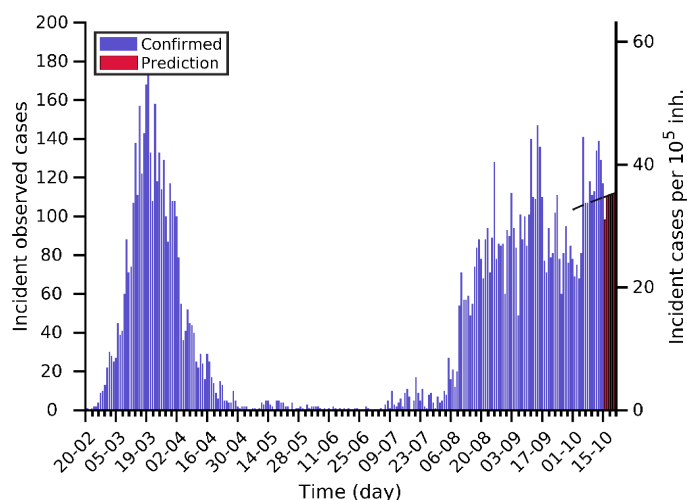


Predictions for next days

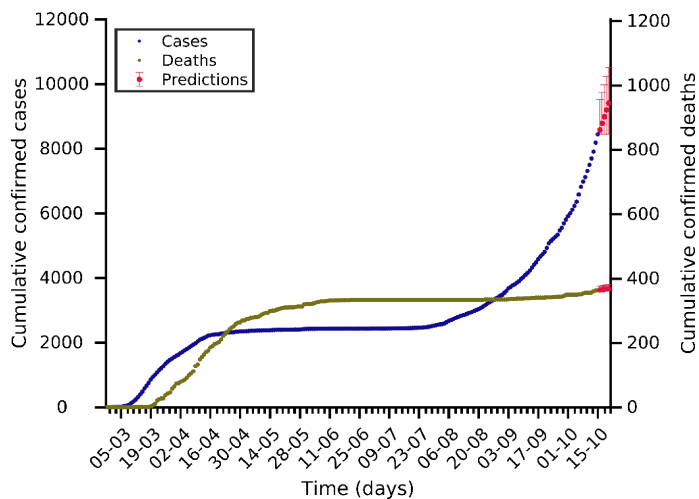
Day	Number of cases	95% Confidence Interval
16-10-2020	10452 (+98)	[ 10354 - 10737 ]
18-10-2020	10674 (+111)	[ 10378 - 10970 ]
20-10-2020	10897 (+112)	[ 10575 - 11219 ]

Current indicators

A <sub>14</sub>	EPG	CFR
476	582	0.95 %



# Asturias 15-10-2020. Pop: 1.0M. Cumulative incidence: 826/10<sup>5</sup>

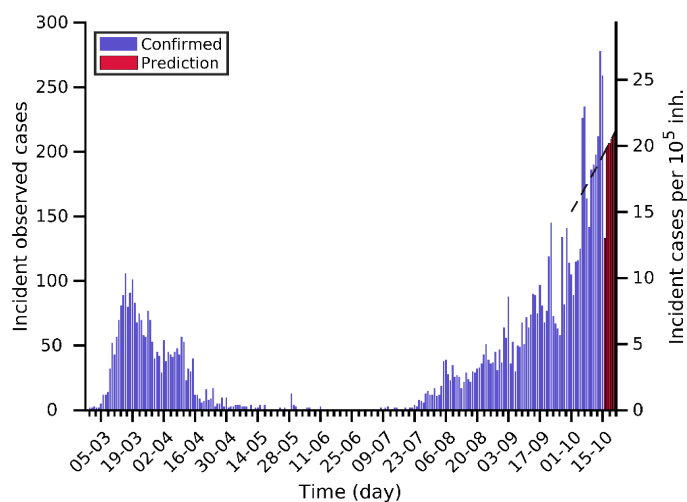


Predictions for next days

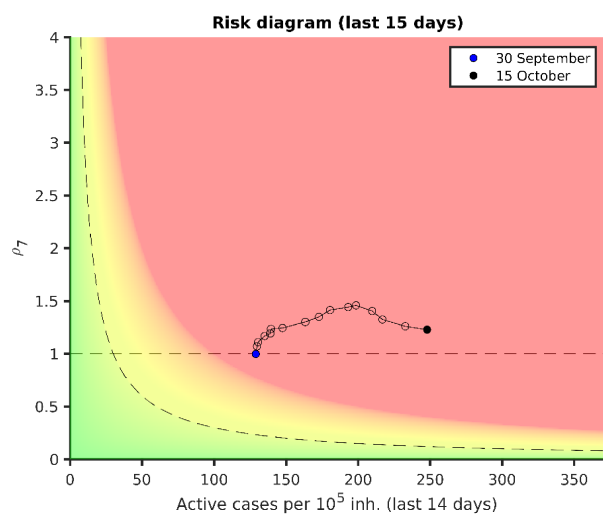
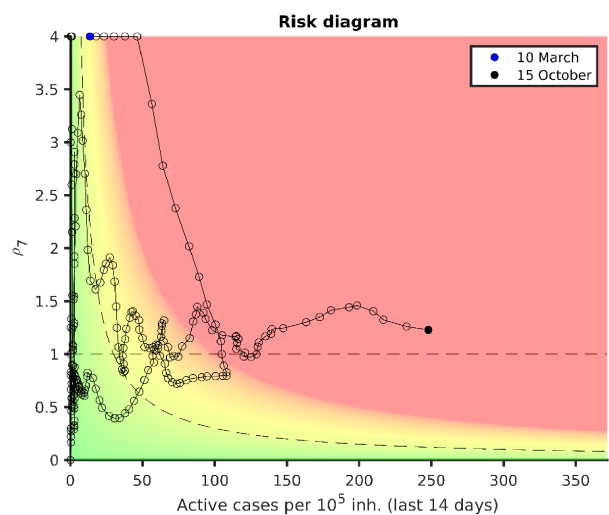
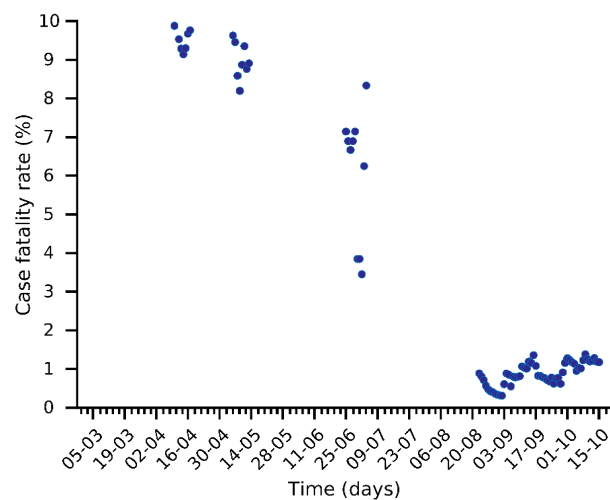
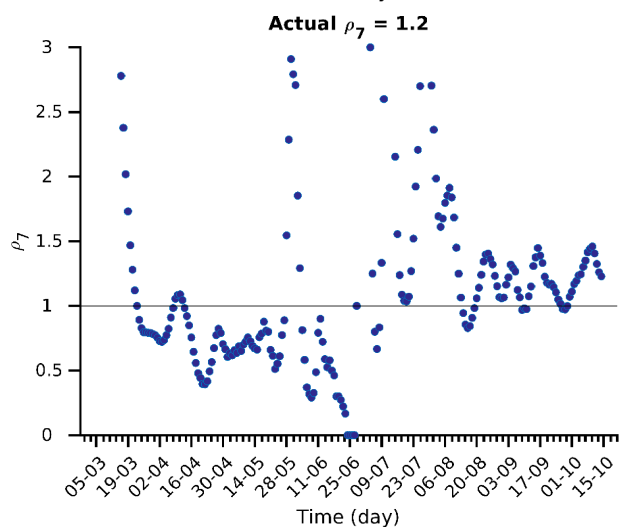
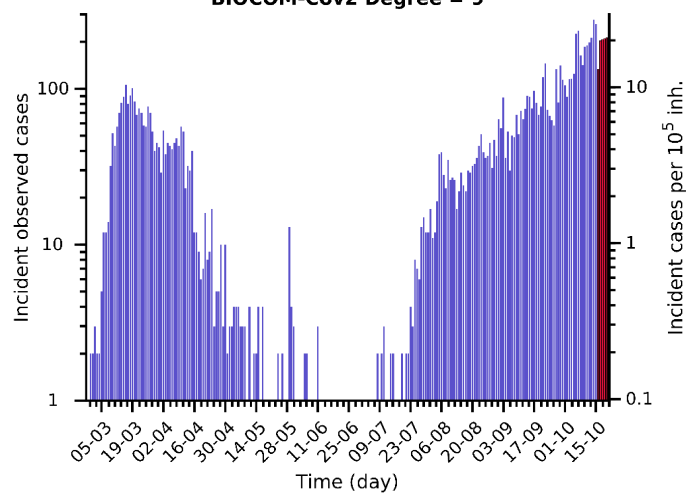
Day	Number of cases	95% Confidence Interval
16-10-2020	8581 (+133)	[ 8448 - 9529 ]
18-10-2020	8991 (+207)	[ 8448 - 9983 ]
20-10-2020	9414 (+213)	[ 8448 - 10510 ]

Current indicators

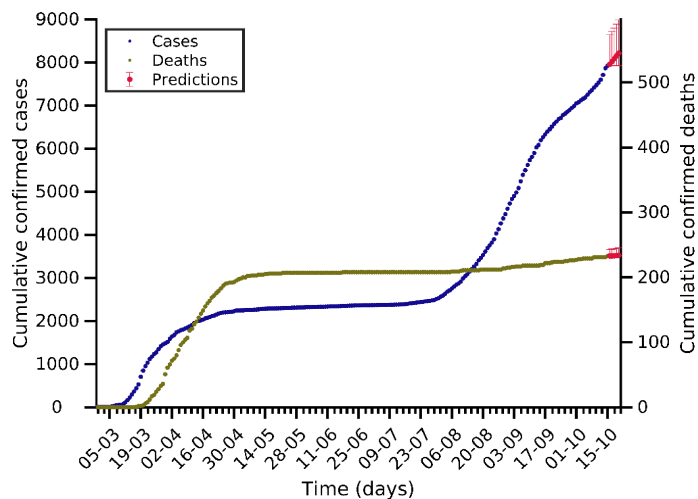
A <sub>14</sub>	EPG	CFR
248	305	1.18 %



BIOCOM-Cov2 Degree = 9



# Cantabria 15-10-2020. Pop: 0.6M. Cumulative incidence: 1364/10<sup>5</sup>

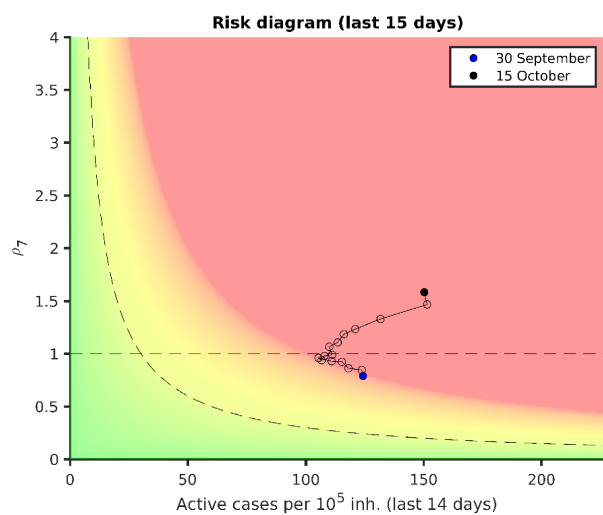
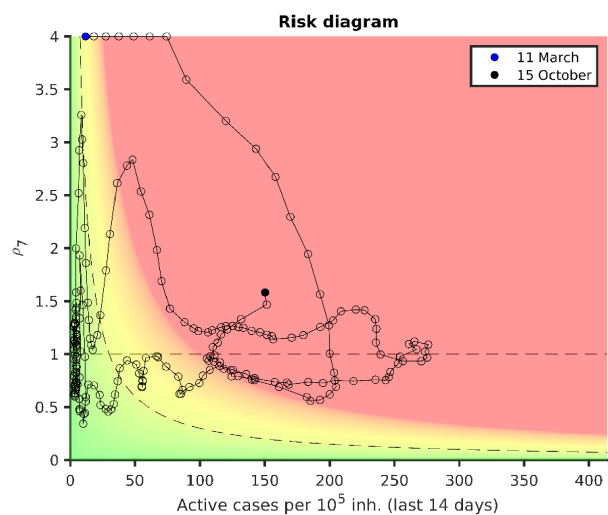
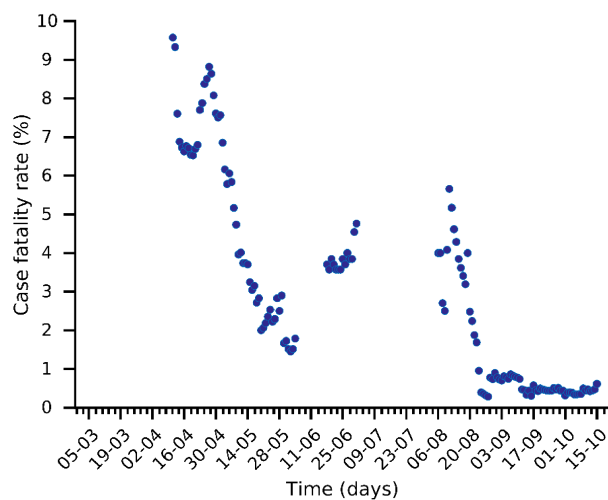
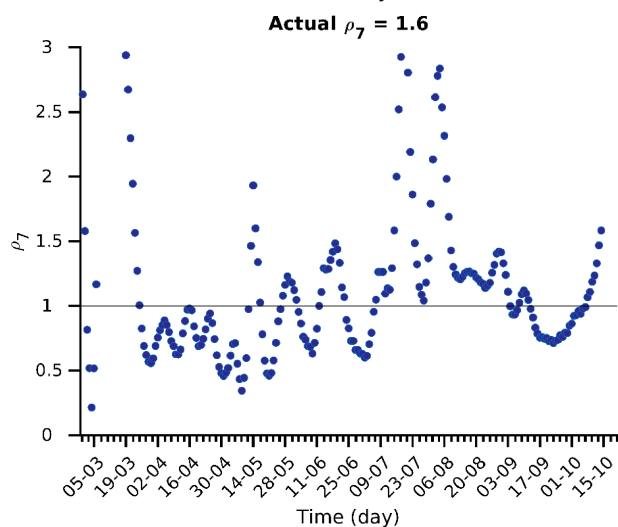
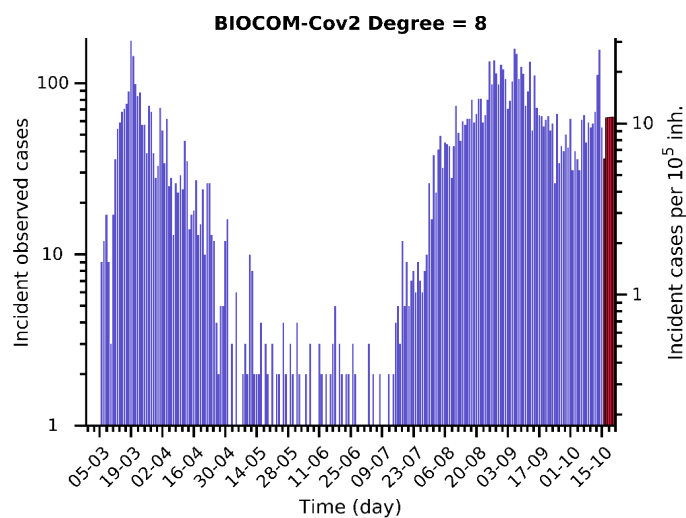
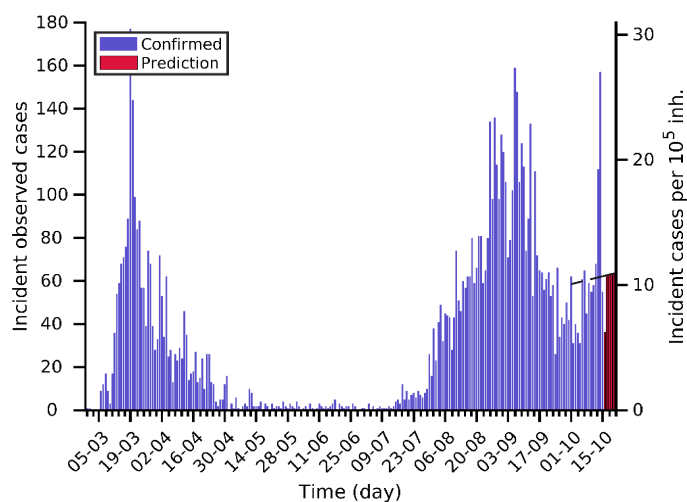


Predictions for next days

Day	Number of cases	95% Confidence Interval
16-10-2020	7962 (+36)	[ 7926 - 8649 ]
18-10-2020	8088 (+63)	[ 7926 - 8802 ]
20-10-2020	8214 (+63)	[ 7926 - 8990 ]

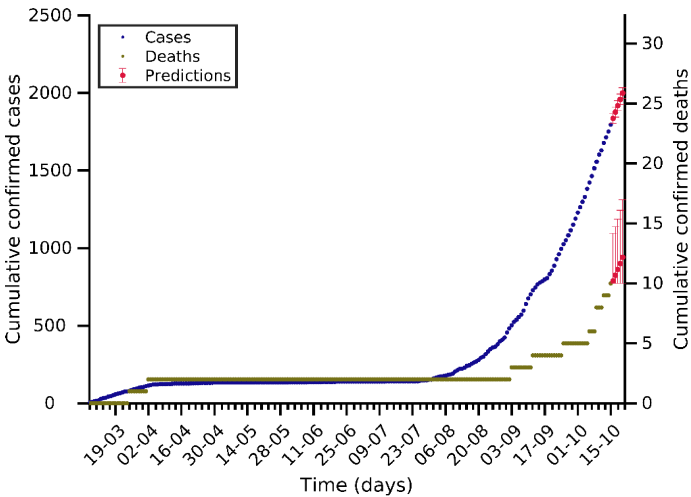
Current indicators

A <sub>14</sub>	EPG	CFR
150	238	0.61 %



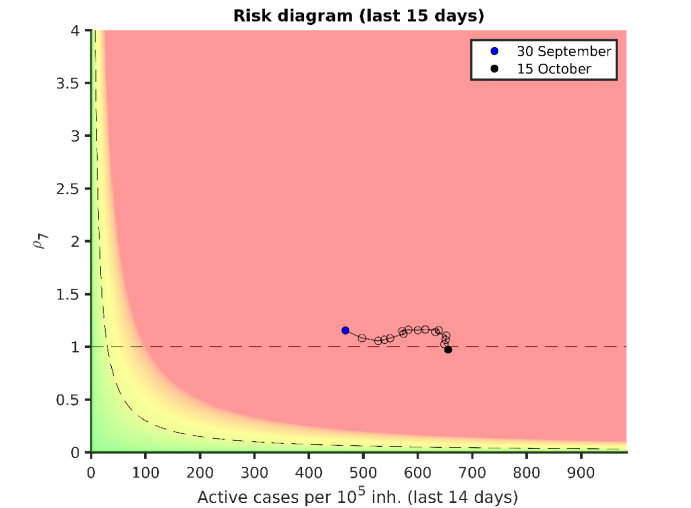
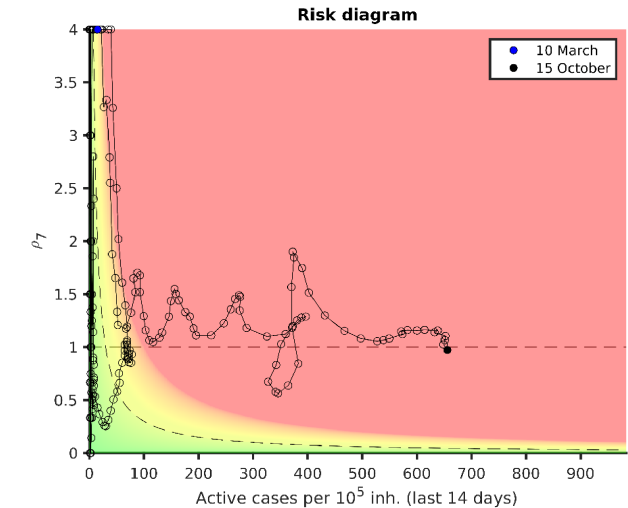
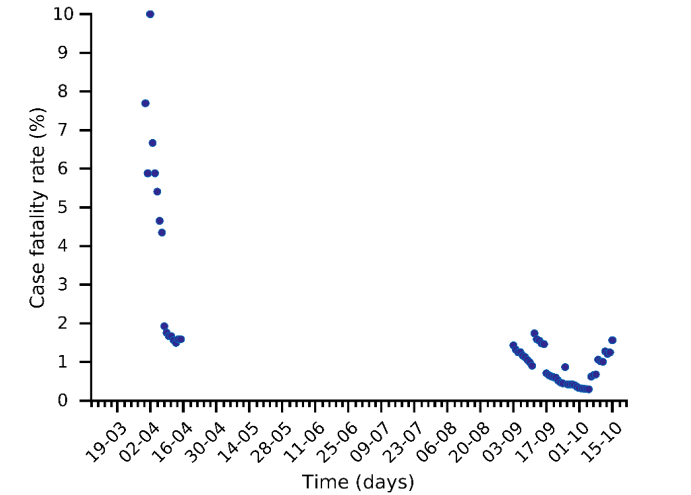
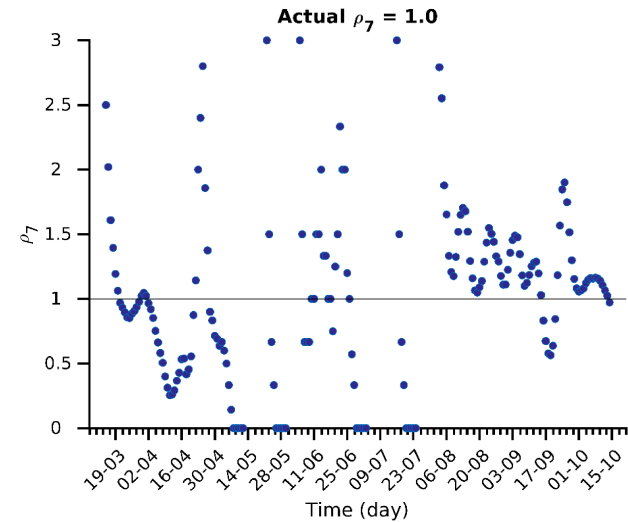
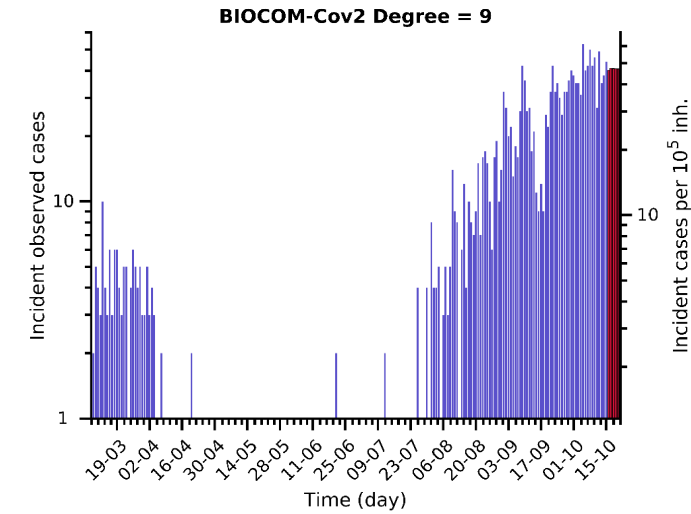
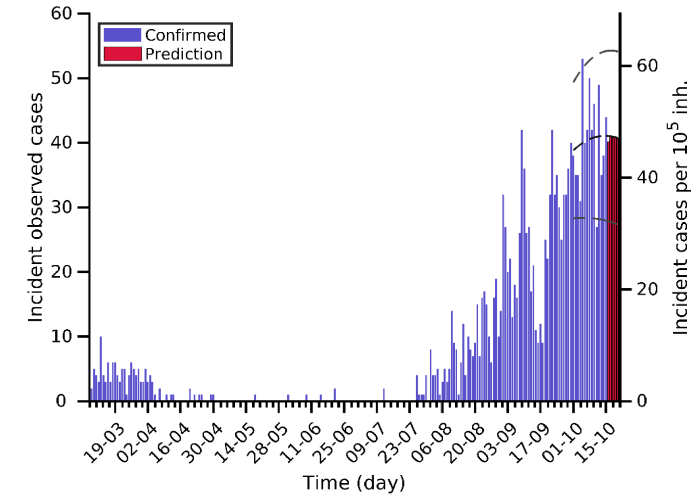


Melilla 15-10-2020. Pop: 0.1M. Cumulative incidence: 2077/10<sup>5</sup>

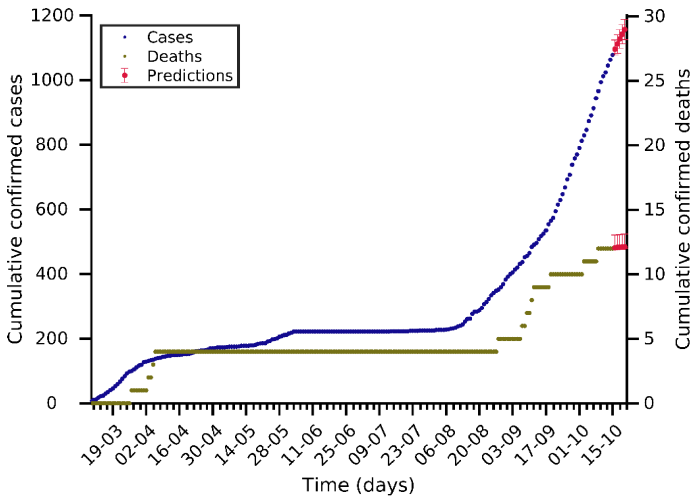


Predictions for next days		
Day	Number of cases	95% Confidence Interval
16-10-2020	1836 (+40)	[ 1805 - 1867 ]
18-10-2020	1918 (+41)	[ 1886 - 1951 ]
20-10-2020	2000 (+41)	[ 1964 - 2035 ]

Current indicators		
A <sub>14</sub>	EPG	CFR
656	638	1.56 %

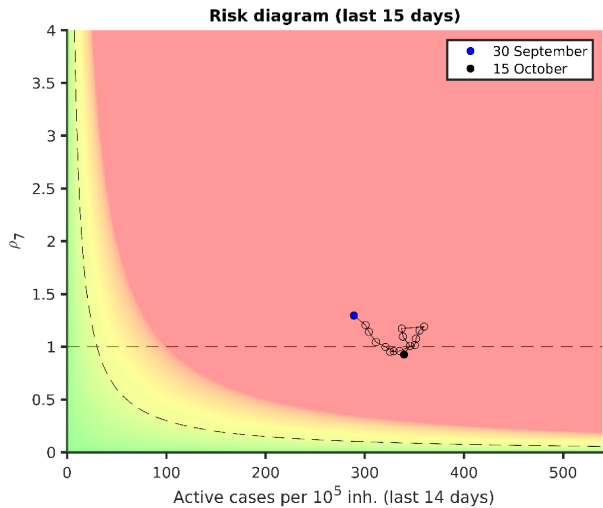
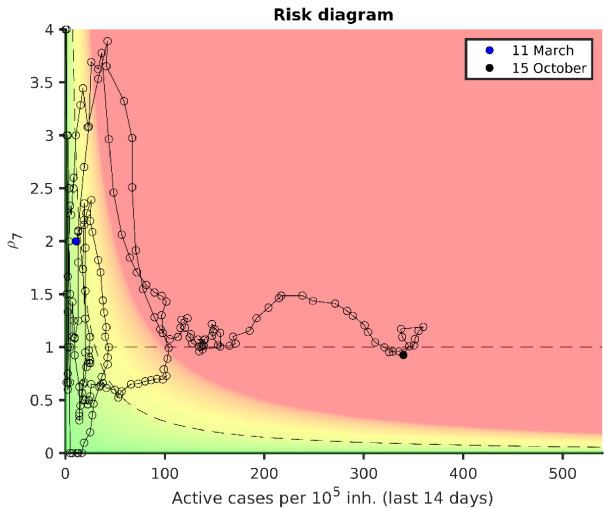
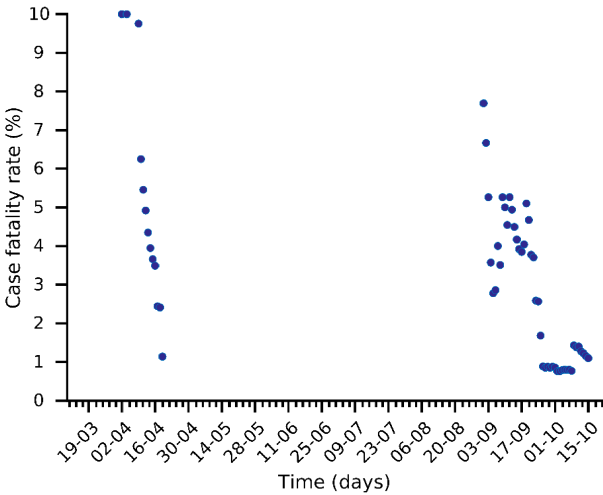
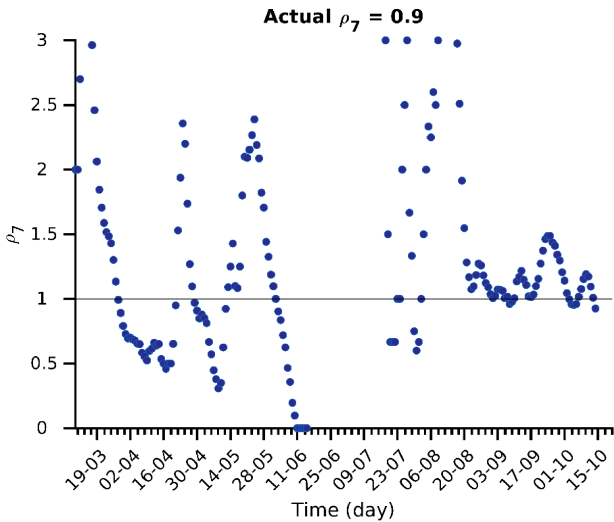
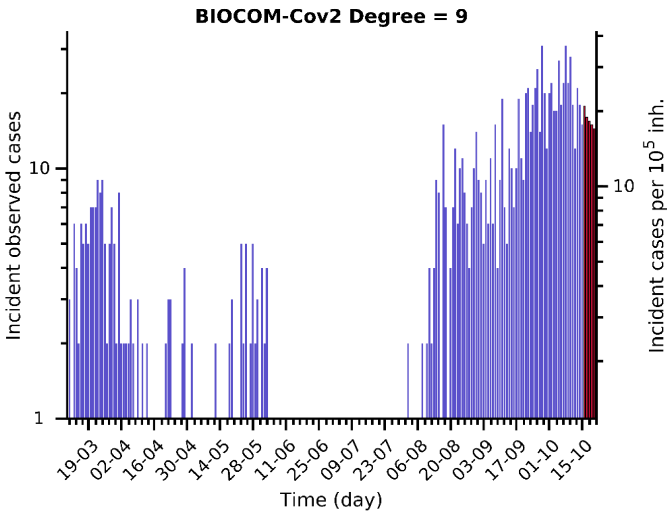
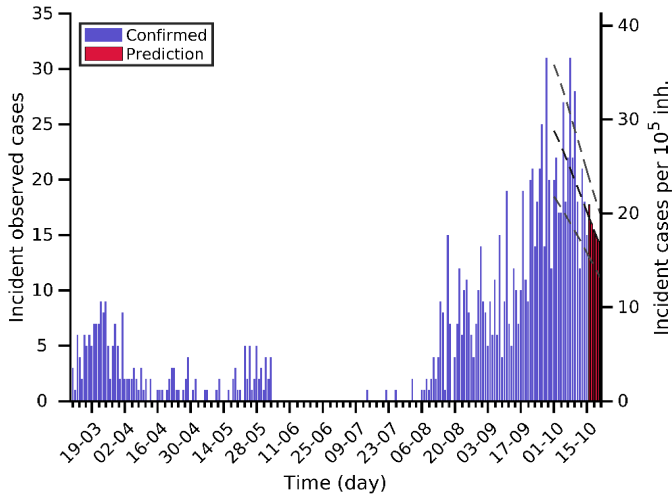


Ceuta 15-10-2020. Pop: 0.1M. Cumulative incidence: 1272/10<sup>5</sup>



Predictions for next days		
Day	Number of cases	95% Confidence Interval
16-10-2020	1096 (+18)	[ 1078 - 1124 ]
18-10-2020	1127 (+15)	[ 1098 - 1156 ]
20-10-2020	1157 (+14)	[ 1126 - 1188 ]

Current indicators		
A <sub>14</sub>	EPG	CFR
340	315	1.10 %



## Methods

## Methods

### (1) Data source

Data are daily obtained from European Centre for Disease Prevention and Control (ECDC)<sup>7</sup> and country official sources (when indicated). Daily data comprise, among others: total confirmed cases, total confirmed new cases, total deaths, total new deaths. It must be considered that the report is always providing data from previous day. In the document we use the date at which the datapoint is assumed to belong, i.e., report from 15/03/2020 is giving data from 14/03/2020, the latter being used in the subsequent analysis.

### (2) Data processing and plotting

Data are initially processed with Matlab in order to update timeseries, i.e., last datapoints are added to historical sequences. These timeseries are plotted for individual countries and for the UE+EFTA+UK as a whole:

- ✓ Number of cumulative confirmed cases
- ✓ Number of reported new cases
- ✓ Number of cumulative deaths

Then, two indicators are calculated and plotted, too:

- ✓ Case fatality rate: number of cumulative deaths divided by the number of cumulative confirmed cases, and reported as a percentage; it is an indirect indicator of the diagnostic level.
- ✓  $\rho$ : this variable is related with the reproduction number, i.e., with the number of new infections caused by a single case. It is evaluated as follows for the day before last report ( $t-1$ ):

$$\rho(t-1) = \frac{N_{new}(t) + N_{new}(t-1) + N_{new}(t-2)}{N_{new}(t-5) + N_{new}(t-6) + N_{new}(t-7)}$$

where  $N_{new}(t)$  is the number of new confirmed cases at day  $t$  after applying a 7-day moving average to the new cases dataset, so that fluctuations (e.g., weekend effect) are smoothed.

### (3) Classification of countries according to their epidemic level: the scale Biocom-Cov

Countries are assigned a degree in the discrete Biocom-Cov scale, which aims to facilitate a simple way of assessing the situation of the country. It is based on the level of daily new cases per 100,000 inhabitants as follows:

Pandemic degree	Daily new incident cases per 10 <sup>5</sup> inh.
0	0
1	0-0.1
2	0.1-0.5
3	0.5-1.25
4	1.25-2
5	2-3
6	3-5
7	5-8
8	8-14
9	>14

<sup>7</sup> <https://www.ecdc.europa.eu/en/geographical-distribution-2019-ncov-cases>

#### ***(4) Fitting a mathematical model to data***

Previous studies have shown that Gompertz model<sup>8</sup> correctly describes the Covid-19 epidemic in all analysed countries. It is an empirical model that starts with an exponential growth but that gradually decreases its specific growth rate. Therefore, it is adequate for describing an epidemic wave that is characterized by an initial exponential growth but a progressive decrease in spreading velocity provided that appropriate control measures are applied. Once in the tail, predictions work but the meaning of parameters is lost.

Gompertz model is described by the equation:

$$N(t) = K e^{-\ln\left(\frac{K}{N_0}\right) \cdot e^{-a \cdot (t-t_0)}}$$

where  $N(t)$  is the cumulated number of confirmed cases at  $t$  (in days), and  $N_0$  is the number of cumulated cases the day at day  $t_0$ . The model has two parameters:

- ✓  $a$  is the velocity at which specific spreading rate is slowing down;
- ✓  $K$  is the expected final number of cumulated cases at the end of the epidemic.

This model is fitted to reported cumulative cases of the UE and of countries that accomplish two criteria: 4 or more consecutive days with more than 100 cumulated cases, and at least one datapoint over 200 cases. Day  $t_0$  is chosen as that one at which  $N(t)$  overpasses 100 cases. If more than 15 datapoints that accomplish the stated criteria are available, only the last 15 points are used. The fitting is done using Matlab's Curve Fitting package with Nonlinear Least Squares method, which also provides confidence intervals of fitted parameters ( $a$  and  $K$ ) and the  $R^2$  of the fitting. At the initial stages the dynamics is exponential and  $K$  cannot be correctly evaluated. In fact, at this stage the most relevant parameter is  $a$ .

It is worth to mention that the simplicity of this model and the lack of previous assumptions about the Covid-19 behaviour make it appropriate for universal use, i.e., it can be fitted to any country independently of its socioeconomic context and control strategy. Then, the model is capable of quantifying the observed dynamics in an objective and standard manner and predicting short-term tendencies.

#### ***(5) Using the model for predicting short-term tendencies***

The model is finally used for a short-term prediction of the evolution of the cumulated number of cases (3-5 days). The confidence interval of predictions is assessed with the Matlab function `predint`, with a 99% confidence level. These predictions are shown in the plots as red dots with corresponding error bar. For series longer than 9 timepoints, last 3 points are weighted in the fitting so that changes in tendencies are well captured by the model.

#### ***(6) Estimating non-diagnosed cases***

Lethality of Covid-19 has been estimated at around 1 % for Republic of Korea and the Diamond Princess cruise. Besides, median duration of viral shedding after Covid-19 onset has been estimated at 18.5 days for non-survivors<sup>9</sup> in a retrospective study in Wuhan. These data allow for an estimation of total number of cases, considering that the number of deaths at certain moment should be about 1 % of total cases 18.5 days before. This is valid for estimating cases of countries at stage II, since in stage I the deaths would be mostly

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<sup>8</sup> Madden LV. Quantification of disease progression. *Protection Ecology* 1980; **2**: 159-176.

<sup>9</sup> Zhou et al., 2020. Clinical course and risk factors for mortality of adult inpatients with COVID-19 in Wuhan, China: a retrospective cohort study. *The Lancet*; March 9, doi: 10.1016/S0140-6736(20)30566-3

due to the incidence at the country from which they were imported. We establish a threshold of 50 reported cases before starting this estimation.

Reported deaths are passed through a moving average filter of 5 points in order to smooth tendencies. Then, the corresponding number of cases is found assuming the 1 % lethality. Finally, these cases are distributed between 18 and 19 days before each one.